COAL MINING

August, 1958 Volume 35, No. 8

rugged equipment for tough jobs...

Allis-Chalmers HD-21 at Perry-Ross Coal Co., Harlansburg

AA-7999

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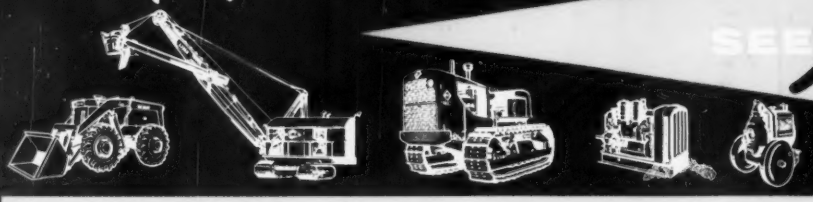


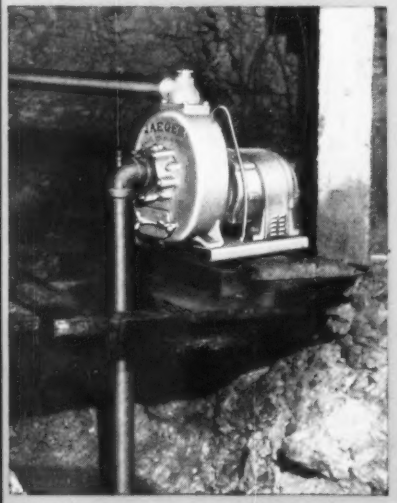
today's mines must have better equipment!

Smooth-running machinery hums a profit tune all its own—a rhythm that's music to the ears of cost-conscious, profit-conscious management.

That's why it pays to rely on Highway. Our experienced equipment specialists help you select exactly the right equipment for your job. We furnish you the latest, improved models designed, built and guaranteed by leading manufacturers. And, we back each equipment item with expert, 'round-the-clock service. AA-7681

Michigan 175As carry heaping loads for Robert Bailey, Philipsburg.

Allis-Chalmers HD-21 clearing overburden at Harold A. Siegel Coal Co., Fryburg.



Still going strong, after over 11,000 hours continuous service, is this Jaeger mine pump.

Highway

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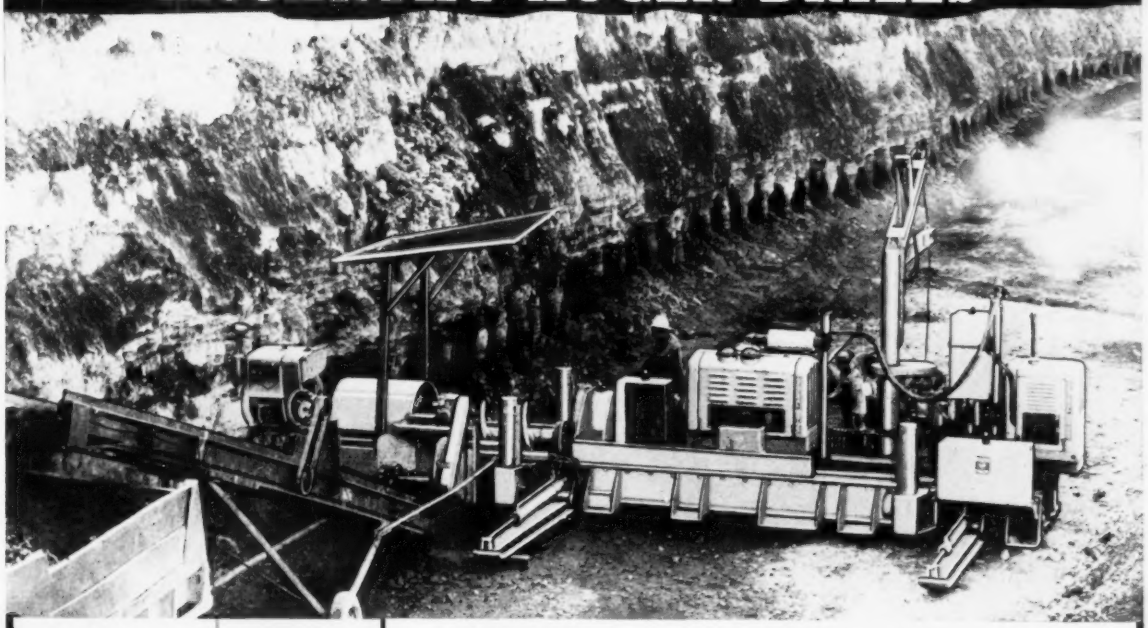
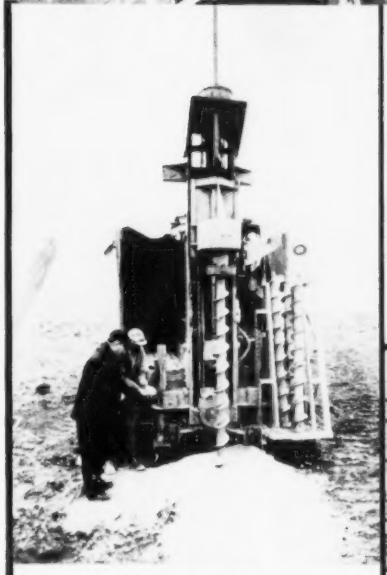
WITH *HEAVY – RUGGED – POWERFUL*

McCARTHY AUGER DRILLS





VERTICAL

MODEL 106-24

World's Fastest Heavy-Duty Vertical Auger Drill

Bores faster, deeper, larger dia. holes than any other auger drill. New gear reduction unit slows auger rotation for operation in hard rock formations. Drills 8" and 9" dia. holes readily in shale and sandstone formations, drills larger dia. holes up to 24" dia. in softer formations.

Write for Bulletin M-100

FINGER-TIP CONTROL

Gives Desired Rotating Speed Of Auger

HYDRAULIC FEED

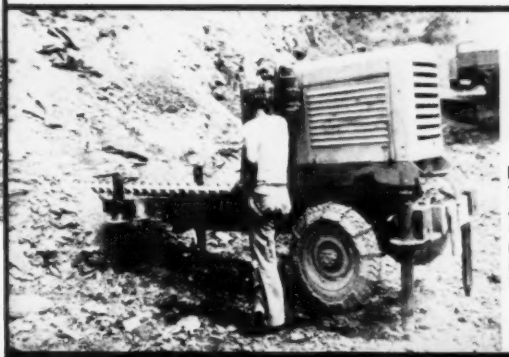
Provides Any Speed Up To 6 Feet Per Minute Horizontal Feed Of Drill

COAL RECOVERY

"Walks" from hole to hole to auger high-quality Bonus Coal

An Ohio miner removes 550 tons of coal in each 8-hour working day with this model 14 36-42 x 12' McCarthy drill, operated by two men. He drills 42" dia. holes 144' deep. Auxiliary conveyor eliminates spillage at hole. It operates on either side of drill for working blind cut. Twelve different models of McCarthy Coal Recovery Drills mine low-cost "bonus coal."

Write for Bulletin M-101 and M-102



HORIZONTAL

MODEL 104

Lowest Drilling Costs per foot, Self-Propelled or Truck-Mounted

Bores up to 12" dia. holes to 150' depth faster, cheaper than any other horizontal drill. Requires less working space, saves many man-hours. . . operates easily in tight, hard-to-reach locations.

Write for Bulletin M-105

THE SALEM TOOL CO.

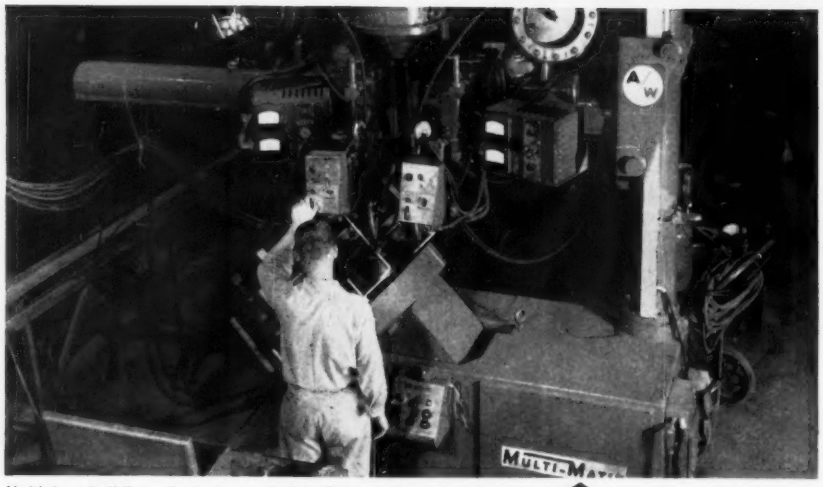
SOUTH ELLSWORTH AVENUE

SALEM, OHIO. U. S. A.

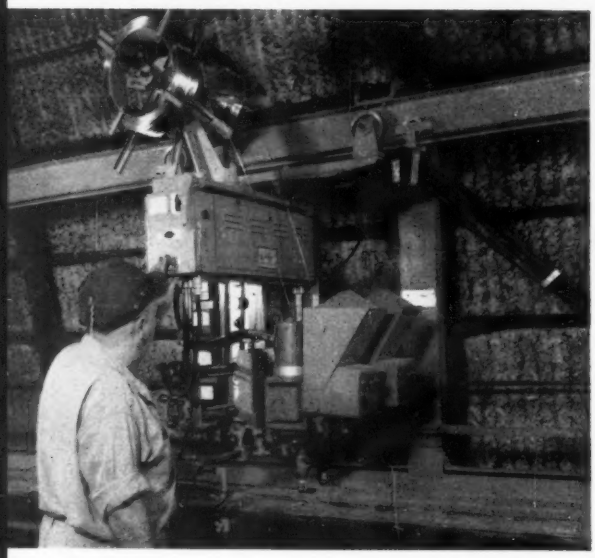
SALEM

Published monthly by Modern Mining Publishing Company. Publication Office—Advance Printing & Litho Co., Erie, Pa. Editorial and Executive Offices—Erie,Pa. Pittsburgh Office—P. F. JASIK, Publisher, 4575 Country Club Drive, Pittsburgh 36, Pa. Price: In the United States, $3.00 year; all other countries $5.00. Single copy 25 cents. Entered as second class matter at the Post Office at Erie, Penna., under the act of March 3, 1879.

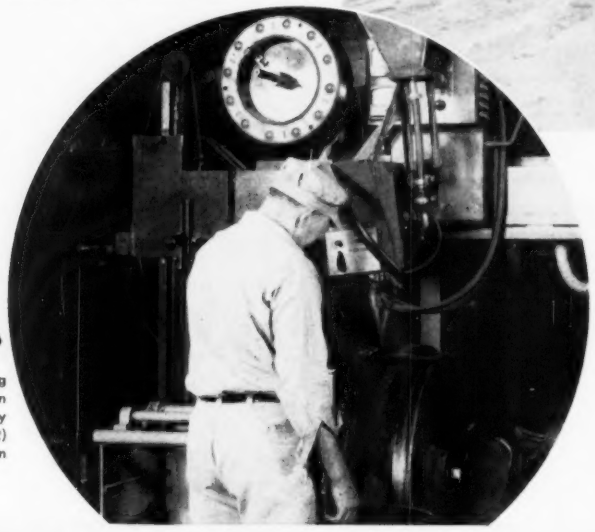
Why BECKWITH is able to rebuild BETTER and with MORE



Multiple rebuilding of single or double flange rollers is quickly and accurately accomplished with this new arc welder. Under Beckwith's "Fair-Price" Roller Exchange Plan you pay only for the cost of bringing your trade-in roller up to factory new-parts standards, based on the class of wear of your old roller. You pay a fair price instead of a flat price.



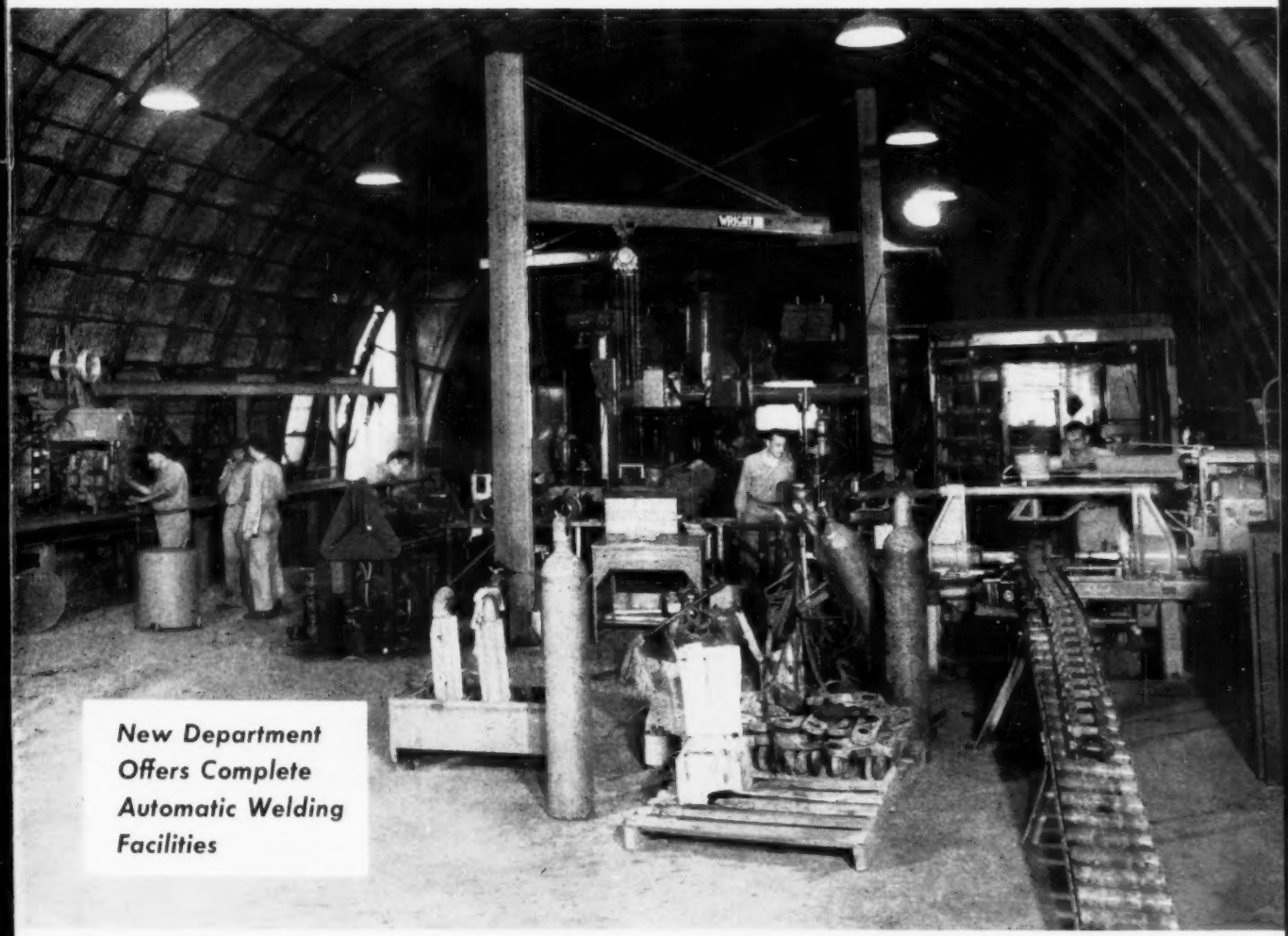
In our "Rail Reviver Plan" we thoroughly inspect your track links, replacing pins and bushings with genuine Caterpillar new parts. We then carefully align a full length of track rail on our modern welding machine and submerge the links in flux. Twin welding heads travel the full length of the track, guided by a photo-electric eye, welding both rails simultaneously and skipping the areas between links. The rebuilt rails are carefully checked out for proper build-up with special gauges which assure you of perfect uniformity of weld from start to finish.



New model submerged arc-welding machine is shown rebuilding a used idler. Our "Idler Rebuild Offer" gives you free information to determine (1) whether your idlers are worn within limits so they can still be built up with weld to make them good as new, (2) whether it is too soon to rebuild or (3) advice that they have worn beyond the most economical rebuild limits.

DANGER! There are wear limits beyond which it is not practical to go if you are considering rebuilding your running gear. There is also the danger of wasting money by rebuilding too soon. See any Beckwith field representative or check with our Service Managers to be sure that your track components are not worn beyond the point of economical rebuilding or to be certain that they actually do need build-up at this stage. We'll give you the true facts.

track links, rollers and idlers
SAVINGS FOR YOU . . .



New Department Offers Complete Automatic Welding Facilities

Tractor undercarriage components can now be rebuilt to their original sizes and specifications at amazingly reasonable prices. The establishment of a completely new Welding Department gives Beckwith the finest build-up facilities East of the Mississippi. Only the latest, most efficient automatic welding machinery was selected in order that we might produce the best work in the most efficient manner . . . and pass the savings on to you.

Our new facilities are manned by experts who have been specially trained in the operation of these machines so that you will receive the quality of workmanship and service which are your rightful "Bonus" as Caterpillar* machine owners.

Add thousands of hours of life to your running gear by taking advantage of our "Fair-Price Roller Exchange Program," the "Rail Reviver Plan" and Beckwith's "Idler Rebuild Offer." Our service men, parts personnel, salesmen and Equipment Service Consultants will be happy to discuss the time- and money-saving features of these various programs. Better still, we would be happy to have you inspect our new department whenever you are in the vicinity of Beckwith's Pittsburgh plant.

*Caterpillar and Cat are Registered Trademarks of Caterpillar Tractor Co.

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● New lightweight tamping poles that permit faster tamping of explosives in both horizontal and vertical blast holes are announced by Austin Powder Company, Cleveland 13, Ohio.

Because poles are constructed of aluminum pipe, they weigh less than half as much as ordinary wooden poles. In addition, they are said to be non-warping, non-splintering and virtually indestructible under normal usage. They also are non-sparking and completely safe for all applications.

Austin aluminum tamping pole with rubber head block.

An exclusive feature of the new tamping poles is the special hook and eye arrangement for adding lengths. This involves passing the hook from the extension pole through the eye at the upper end of the lead pole. The resulting union is said to be strong enough to withstand heaviest leverage without slipping, loosening or breaking free.

Austin tamping poles are offered with $1\frac{5}{8}$, $4\frac{1}{2}$ or 5-inch diameter rubber head blocks. Lengths of 4 to 20 feet are available. For additional data, request bulletin LL-5644.

● Charles J. Cooper, previously employed by the Caterpillar Tractor Co., of Peoria, Illinois, has joined Beckwith Machinery Company as an earthmoving specialist.

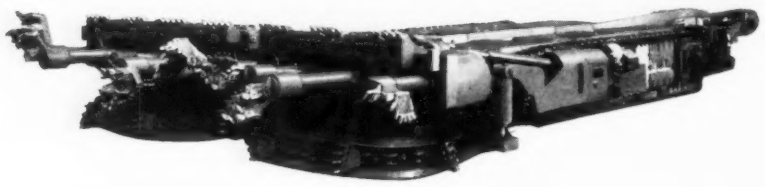
Charles Cooper

Beckwith Machinery Company represents Caterpillar Tractor Co. and other earth moving equipment lines in Western Pennsylvania, portions of Maryland and in West Virginia. Mr. Cooper has had extensive experience in analyzing earth moving problems and recommending the most efficient equipment and procedures, according to William H. Dickey, Vice President and General Manager of Beckwith Machinery Co.

Mr. Cooper is a graduate of the Iowa State College and while with Caterpillar served in the Sales Training Division as an instructor, became a product specialist on track-type tractors for Caterpillar's Sales Development Division, and most recently acted as earth moving representative in Caterpillar Tractor Company's eastern division. His Beckwith headquarters will be at the Pittsburgh, Pennsylvania location.

Makes a cut 14′ 7″ wide

All the benefits of fast, efficient, continuous mining . . . in seams as low as 28 inches



JEFFREY 86-A COLMOL

Jeffrey 86-A "Colmol" is only 25½-inches high . . . mines seams as low as 28 inches . . . gives good cleanup, smooth bottom.

Specially designed cutting and gathering chain carries coal to the center of Colmol, then up to the swinging discharge conveyor. It smooths off cusps, even when breaker-arm head is raised 8 inches for maximum mining height.

This powerful, compact Colmol advances with minimum maneuvering. Coal is broken from the face . . . not ripped or ground off. You get good overall screen consist, greater speed and efficiency. Colmol withstands the most severe mining conditions, operates with little noise or vibration.

All adjustments are hydraulic, can be made instantly and accurately. Safety features provide extra protection for both personnel and machine.

For low seams . . . or seams up to 8 feet high

Colmols step up your production rate, cut operating and maintenance costs. Write for full details. The Jeffrey Manufacturing Company, 969 North Fourth Street, Columbus 16, Ohio.

JEFFREY

MINING • CONVEYING • PROCESSING EQUIPMENT . . . TRANSMISSION MACHINERY . . . CONTRACT MANUFACTURING

COAL MINING

Vol XXXV August, 1958 No. 8

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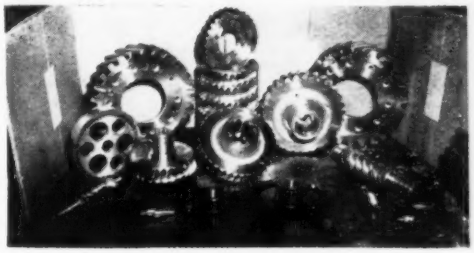

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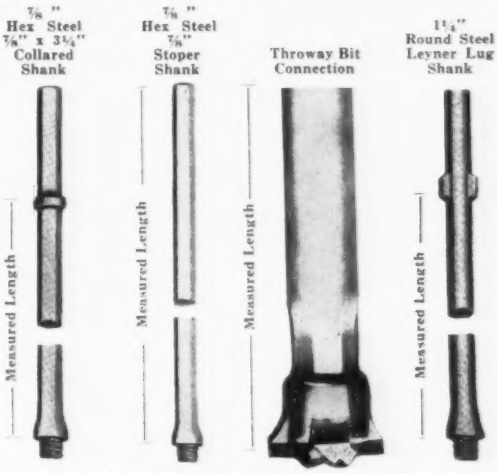
⅞ " Hex Steel ⅞" x 3¼" Collared Shank
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Measured Length
Measured Length
Measured Length
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Drill Steels Furnished with Any Type End
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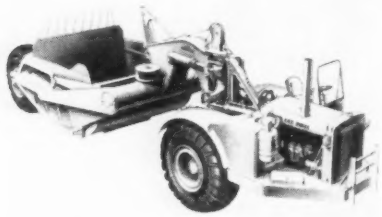
SALEM "HERCULES" AUGERS FOR ELECTRIC DRILLS
Made to Withstand High Drilling Speed Whip And Torsional Strain Of Electric Drills.

Drills holes faster — Will not snap off shank or chip points — Outlasts four or five ordinary augers.
THE SALEM TOOL COMPANY EDgewood 7-3416 SALEM, OHIO, U.S.A.

● A new series of DW20 and DW21 wheel Tractors, equipped with SUPER-TURBO Engines which offer more power and greater operating efficiency, has been introduced by Caterpillar Tractor Co.

The new wheel tractors are designated the Cat DW21 (Series D) and DW20 (Series F), and their SUPER-TURBO Engines have been designed to provide a maximum horsepower output of 320, accompanied by significantly improved torque rise characteristics. Operationally, these improvements combine to give these new machines the advantages of increased lugging ability and higher travel speeds.



The recently-introduced Cat DW21 (Series D) wheel Tractor is powered by the new 320 HP (maximum) Cat SUPER-TURBO Engine, which gives it the benefits of increased lugging ability and higher travel speeds. The SUPER-TURBO Engine also powers the new Cat DW20 (Series F), which was introduced simultaneously with the new series DW21. Of prime importance in the SUPER-TURBO is the use of an improved air induction system, which constitutes a new concept in diesel engine turbocharging.

Of prime importance in the SUPER-TURBO Engines is the introduction of a new concept in diesel engine turbocharging. Caterpillar engineers have incorporated an improved air induction system, intended to improve on the normally high fuel-combustion efficiency and power output of turbocharged engines.

Primarily, the air induction system of the SUPER-TURBO Engine provides accurate control of Turbocharger speed over its complete range and delivers more air to the engine. By contrast, standard turbochargers operate at reduced RPM when the engine is working at below-maximum engine speed. On the SUPER-TURBO Engine, the control of Turbocharger speed allows the engine to operate at maximum efficiency regardless of its changing load requirements.

As an additional aid to peak engine efficiency, temperature of the air leaving the Turbocharger and entering the cylinder is lowered in going through an after-cooler, increasing the air density. This denser air, when packed into the cylinder, provides additional oxygen for the combustion of more fuel, and the generation of more horsepower. Research tests have shown that the after-cooler results in 14% more air (by weight) being delivered to the engine.

Twin air cleaners and larger manifolds provide for increased breathing capacity.

Several operational benefits result from these exclusive engine features. Perhaps of greatest significance is the more than double torque rise afforded by the SUPER-TURBO Engine, which gives the wheel tractors greater lugging ability when operating under heavy loads.

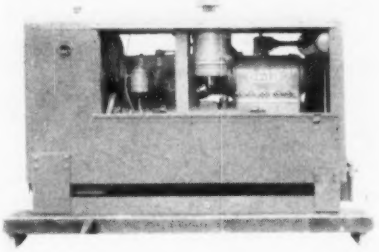
Another operating characteristic of the SUPER-TURBO Engines is their ability to provide equal rimpull for the new DW21 and DW20 at 10% higher travel speeds. Top speed of the DW21 is 22.6 MPH, compared to 20.5 MPH on the previous series DW21. Top fifth-gear speed on the new Cat DW20 is 35.8 MPH, an increase of 3.7 MPH over the previous model.

In addition to the new air induction system, many engine components have undergone design changes, in order to closely match the improved operating characteristics of the engines.

Included are new pistons; stronger piston pins, pushrods, rocker arms, camshaft, a newly-designed cylinder head and block, the introduction of new bearings, and the addition of a primary fuel filter.

For greater protection of the radiator on both new series of wheel tractors, a heavy-duty radiator guard has been mounted on each. Design of the guard provides protection, without restricting the cooling efficiency of the radiator. In addition, a bumper, equipped with easily-accessible pull-hooks, has been incorporated on the DW21.

● A special 125 c. f. m. compressor, for cross-mounting on motor trucks, is announced by Davy Compressor Co., Kent, Ohio.



Known as Model 125-RP Hydrovane rotary skid, the new unit features a compact weatherproof control panel mounted on the curb end of the compressor. Located adjacent to clutch lever and air outlets, this permits easy one-man operation of the machine. It is furnished as standard equipment, without extra charge on all Davy skids for cross mounting.

According to the manufacturer, the Model 125-RP is extremely compact. It is 81 inches long, 34 inches wide and 51 inches high. Weight is 2300 lbs. The Hydrovane rotary compressor, said to have less than one-half as many working parts as other units of the same capacity is powered by a Hercules GO 198 engine.

● Bulletin 925 is the story of the PERMASEAL Idler in eight comprehensive pages. Detailing the Idler's development from laboratory to installation, the book outlines the Double Flexible Diaphragm Seal which keeps grease in, dirt out; permanent factory lubrication as well as types of PERMASEALS and typical installations. Drawings, photographs and detailed exposition make this book a requisite working manual for all personnel concerned with the problem of moving materials by conveyor whether it be in a mining or industrial capacity.

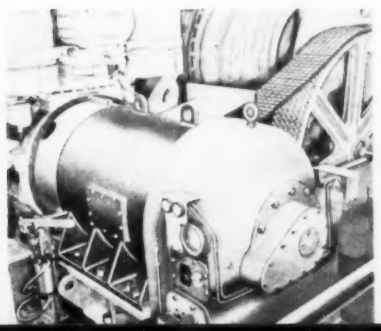
LIMA Type 2400 with Torque Converter moves overburden faster at lower cost

The torque converter, standard equipment on all LIMA Type 2400 machines, is another of the quality features that enable LIMAS to outperform and outlast ordinary machines. It automatically increases torque as required by the load, making higher output possible by avoiding stalling and making performance much smoother and faster.

For assignments calling for an electrically-powered 6-yard machine, the LIMA Type 2400 is available with complete electrical power package. Combining a single AC electric motor with a single stage torque converter, this drive matches, *electrically*, diesel-torque converter performance. You get maximum power performance under all operating conditions . . . and the motor won't stall or burn out.

Cable life is increased and machinery maintenance reduced because shock loading is minimized as the oil in the converter cushions any sudden blow. Friction clutches last much longer because the torque converter reduces friction clutch slippage during acceleration.

LIMA quality design and construction extras make for profitable, efficient operations with minimum downtime. There's a LIMA type and size for every job—shovels ½ to 6 cu. yds., cranes to 110 tons and draglines variable. Smaller capacities are available on rubber. For full details, contact your nearby LIMA distributor, or write Construction Equipment Division, Baldwin-Lima-Hamilton Corporation, Lima, Ohio.



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Construction Equipment Division—LIMA WORKS

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● The W. G. Duncan and Peabody Coal Co. of Greenville, Ky., has just placed in service the largest electrically powered shovel built by the Bucyrus Erie Co., of South Milwaukee, Wis.

The giant is taller than a 13-story building, weighs 2,400 tons and is powered by 15 large direct current motors that force the 55-yard capacity dipper on it's 86 ft. long dipper sticks into the broken rock, lift it, swing it and dump it; some 300 ft. away from the digging point.

The 80 ton load is raised high by virtue of a 145 ft. boom through which is reeved one-half mile of wire rope for the hoist and boom lines.

The "Queen" moves on four mighty "cats" and each corner of the massive frame is supported on a hydraulic jack that is self leveling by reason of a mercury switch controlling the oil pressure automatically in keeping with the terrain the shovel moves over.

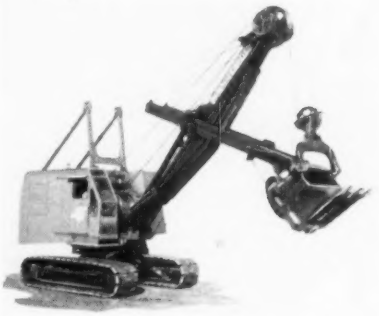
The control cab is air conditioned and equipped with modern instrumentation that records the current and time required to complete a cycle-dig, swing, dump—dig.

The machine is capable of moving 100,000 tons of overburden in 24 hours. The uncovering of the coal seam will produce some 2 million tons of coal per year with smaller shovels handling the coal digging.

● Manitowoc Engineering Corp., Manitowoc, Wis., announces the addition of the new, 3-yd. Model 3600 shovel to the company's line of cranes and excavators. Basically a shovel, the Model 3600 is also convertible to crane, clamshell and dragline applications.

The new Manitowoc Model 3600 employs such ultra-modern components as the 3-stage torque converter coupled to a fast, rugged engine equipped with the Manitowoc "Torque Limiting Tail Shaft Governor." This combination allows the machine to take full advantage of the tremendous reserve of power available through torque conversion yet takes responsibility for restraint of torque wherever it could be harmful to the excavator.

The new Model 3600 contains just 14 gears in the entire machine with the gears turning only when working to reduce power loss. This is accomplished with the exclusive Manitowoc "Powerflow" slide pinion arrangement which directs power straight to the operating function. Easy operating air controls are available for every operating function including steering.



Designed as a "working partner" with other machinery used on today's construction projects, the boom, sticks and shipper shaft of the 3600 are so tough that there is no need to "baby" the front end and the dipper will not twist away or glance off exceptionally tough digging areas. The shipper shaft is positioned at an ideal location on the boom so that the machine can achieve working ranges tuned to modern construction practices and the size and shape of modern hauling units.

Outstanding mobility between jobs and on the job is aided by components such as the Manitowoc Self-removing counterweight for easier between-job shipment or trailering without exceeding highway weight restrictions. A low overhead clearance of only 14′ 6½″ is possible because the gantry folds down flat on the cab, while the boom stretches out straight ahead.

The new unit has a rugged, "closed-face" box design tread which is self-cleaning. With this tread construction, plus direct power flow to the travel gears the 3600 will climb 30% grades over any terrain.

Complete information on the new Model 3600 shovel can be obtained from your Manitowoc distributor or by writing to the Manitowoc Engineering Corp., Manitowoc, Wis.

● **There was 100 percent cooperation of officials and workmen in the United States Bureau of Mines Accident Prevention course recently completed at the Johnstown Coal and Coke Company's Crichton N. 4 Mine at Nettie, W. Va. Lloyd G. Fitzgerald, Mining Engineer, Mount Hope, W. Va. demonstrates to some of the group how gas-air or low oxygen-air mixtures may be detected with a Flame Safety Lamp. Observing the demonstration are (Left to Right); Walter Corroll, Oliver Ordorff, and B. R. Chamberlin tipple men; Percy Galeoner, general superintendent; Instructor Fitzgerald; W. A. O'Dell Tippleman; Roma Starcher, Foreman; Charles F. O'Dell, Tipple man; Glover O'Dell, foreman; Raymond Chamberlin, Tipple man and Tennis Halstead, foreman.**

296,000 yds. Overburden per Month

averaged by this Model 728 Page Dragline with 150 ft. boom and 12 yd. bucket.

Overburden 60 to 80 ft., coal seam 34 in., so average ratio of overburden to coal is 24.7
Working three 8-hr. shifts, six days a week, uncovered

144,000 tons of Coal in 12 Months

RATIO 24.7 to 1

Owned by W. P. Stahlman Coal Co., Corsica, Pa. — and Mr. Stahlman is so well pleased with this machine's performance that he is now erecting another Model 728 Page just like it.

Having previously used three 5 yard, 120 ft. boom draglines, Mr. Stahlman knows the big reduction in stripping costs made by the 12-yd., 150 ft. boom Page.

And you need SPEED for low cost stripping. Page walkers swing unusually fast, with a correspondingly fast hoist line speed. The result — quicker cycles and more yardage.

And you need LOW MAINTENANCE COST such as reported by users of Page Draglines with V-Type Diesels, designed specifically for dragline work — with bigger bearings and pistons, and slow speed, 450 RPM — producing ample power with low operating cost. (Can also be furnished with Electric Power).

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Hazleton National Bank Bldg.
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For High Production and Lowest Operating costs—

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SINGLE DECK WALKING DRAGLINES

Do You Know?

● Occupational stress has been found to be the most prevalent of three contributing factors common to 100 sufferers of heart diseases, a ten-year study shows.

Heredity and fat consumption were the other two factors most frequetly found to influence coronary disease.

The study was conducted by Dr. Henry I. Russek, a consultant in cardiovascular research at the U. S. Public Health Service Hospital, Staten Island, N. Y., and Dr. Burton L. Zohman, associate professor of medicine at the State University of New York College of Medicine in Brooklyn.

Questions answered by the study, published in the current American Journal of the Medical Sciences, include the problem of overwork and long hours. Over 90% of those in the experimental group, all between the ages of 25 and 40, had been under severe occupational stress for varying periods before the appearance of heart disease. All had hardening or narrowing of the arteries.

One fourth of the patients held two jobs while another 46% worked at least 60 hours per week.

Others showed unusual fear, insecurity, discontent, frustration, reslessness or inadequacy in employment. The 100 subjects in the normal group did not experience any such emotional upset, according to the study.

Heredity, another factor which showed significant data, has long been linked with causes of heart disease. The study showed that 67% of the patients had a history of some heart disease for one or both parents. However, a positive history is not a certain death certificate nor a negative history a guarantee of longevity, the doctors reported.

Over half of the patients were accustomed to large amounts of fat in the diet, while regular exercise, or the lack of it, show no correlation with normal health or early heart afflictions.

Tobacco smoking proved to be more prevalent among the heart group under study, and the patients were more addicted than the normal group. The heart researchers pointed out that the heavy smoking habits of the patients appeared to be the result of heightened emotional strain rather than a direct cause of disease.

Overweight did not seem to play a significant role in the casual relationship, the study showed.

HERE AND THERE IN THE COAL INDUSTRY

● THE OHIO COAL ASSOCIATION elected W. M. Osborne, of Youghiogheny & Ohio Coal Co., to serve as president, succeeding Henry G. Schmidt, of the North American Coal Corp. W. D. Hamilton, Oglebay Norton Co., was elected vice president, and Ford Sampson was reelected executive secretary. The directors elected, in addition to Messrs. Osborne, Hamilton, and Schmidt, are R. L. Ireland, Consolidation Coal Co.; Whitney Warner, Jr., Warner Collieries Co.; A. N. Prentice, Central Coal Co.; S. B. Johnson, Jr., Lorain Coal & Dock Co.; Cecil Guthrie, Simco-Peabody Coal Co., and Paul Beutel, Columbia-Southern Chemical Corp.

About 80 Association members and guests attended the meeting, at the Cadiz Country Club. Principal speaker was Tom Pickett, NCA executive vice president, who discussed the importance of coal association activity and the value of member cooperation in association work at the state and national levels.

● Directors of the Big Sandy-Elkhorn Coal Operators Association have elected William Crawford, vice president of operations, Princess Elkorn Coal Co., Mallory, W. Va., to serve as president. He succeeds W. W. Goldsmith, president of Floyd County Coal Co., Inc., of Charleston, W. Va. As first vice president the directors named B. F. Reed, secretary-treasurer of Turner Elkhorn Mining Co., Drift, Ky. Second vice president is George E. Evans, Jr., president of Evans Elkhorn Coal Coal Co., Inc., Wayland, Ky. L. B. Brashear, president of Stephens Elkhorn Fuel Corp., Manton, Ky., was reelected treasurer. The board which met June 13 at Lexington, Ky., has not yet filled the position of executive secretary, left vacant by the recent resignation of C. W. Davis to become executive secretary of the Bituminous Coal Operator's Association in Washington.

● Frank A. Burns has been appointed superintendent of the Crucible Steel Company of America's coal mine in Crucible, Pa. He succeeds A. V. Faull who was transferred to the recently-acquired Hugheston Mine in West Virginia.

Mr. Burns has been connected with the coal mining industry since 1948 when he worked as an engineer in training and later as assistant to the superintendent with the Bethlehem Mines Corp. Coming to Crucible in 1953, he served as engineer-mining practices, assistant mine foreman, general assistant mine foreman and acting mine superintendent.

● A "no-hands" factory, automatically milling, drilling and boring vital parts for electronic defense systems, is in operation in Los Angeles, Calif.

The nation's first completely electronically controlled line of machine tools is operated from punched tapes and transistorized digital computers at a Hughes Aircraft Company plant adjoining International Airport.

It is designed to handle the majority of machining jobs in lots of a few hundred or less, with dimensions no greater than eight to 12 inches in any direction. This is in contrast to the specialized mass-production machining of automobile manufacturers.

The "building block" priciple is employed in designing both machine tools and control system. Each machine tool is designed to fit in a standard space on an automated assembly line, so that any number and sequence of machines can be used side by side.

The system has a simple dial-correction method to compensate for machine-tool wear.

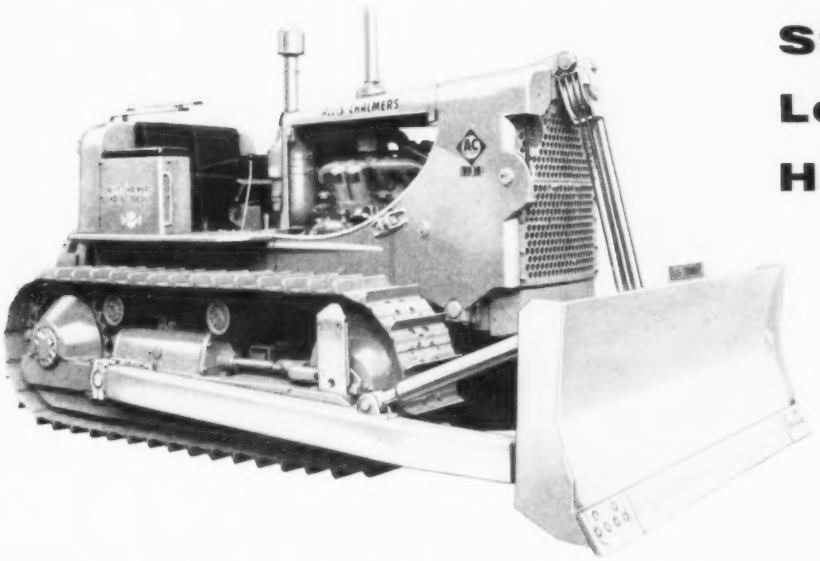
A very accurate method of measuring the distances the machines must travel to reach the proper spot has been devised. It is based on counting off the proper number of ten-thousandths of an inch on an electromagnetic measuring scale that moves with the machine.

Changes in operations may be introduced or production may be started on new parts merely by changing punched tapes and without stopping the machines.

Because the line is automatic, only one operator is needed. Control tapes can be punched by a typist after only a few hours' instruction. In the prototype system demonstrated here, the human operator needs only to place unmachined castings on the line and remove finished parts. But even this operation can easily be made automatic.

ALLIS-CHALMERS EQUIPMENT for

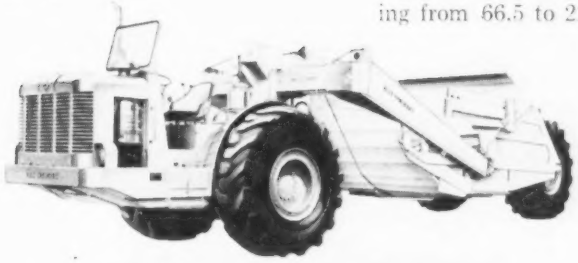
Stripping, Loading, Hauling



150 net engine hp
(torque converter drive)
148 net engine hp
(standard transmission)
41,000 lb (approx.)
with cable-controlled
bulldozer

HD-16 Crawler Tractor Here is the big tractor value for many strip mining jobs. With choice of hydraulic torque converter drive or dual range, constant mesh transmission, the HD-16 quickly clears brush, stumps and boulders to open new areas. When stripping operations begin, it removes overburden with matched Allis-Chalmers bulldozer, pushes or pulls scrapers, and stockpiles overburden for future reclamation. During mining operations, it moves material within reach of excavators, helps build access roads, moves drill rigs and other equipment . . . handles countless pushing and pulling jobs. Three other crawler tractor models are available, ranging from 66.5 to 225 net engine hp.

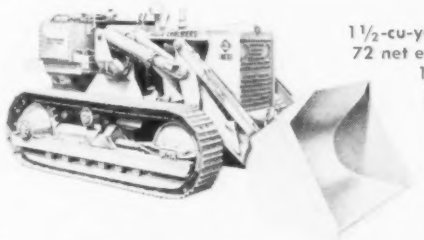
15 yd struck
20 yd heaped
280 hp



TS-360 Motor Scraper is designed for big-capacity stripping jobs. Curved bowl bottom and offset cutting edge help get full loads fast. High apron lift and positive, forced ejection combine to dump all material cleanly and spread it evenly.

An interchangeable bottom-dump body can be used for fast off-highway hauling. Two other Allis-Chalmers motor scrapers are also available with 9½-yd and 14-yd heaped capacities.

1½-cu-yd bucket
72 net engine hp
19,600 lb
(approx.)



HD-6G Tractor Shovel Has the mobility to move quickly from one job to another anywhere in the mine . . . has the power and capacity to handle a variety of digging and loading operations. This combination has made the HD-6G a popular handyman in many strip mines. Three larger tractor shovels are also available with standard buckets up to 4 cu yd and coal buckets up to 7 cu yd.

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FIDELITY BUILDING · CLEVELAND

Electrical Insulation FOR ROTATING EQUIPMENT

By

WILLIAM SCHNEIDER

Engineering Manager
Apparatus Repair
Manufacturing and
Repair Divisions
Westinghouse Electric Corporation
Pittsburgh - Gateway Center

Open Pit Mining Association 14th Annual Meeting
University of Kentucky, Lexington, Ken., June 19, 1958

The Fourteenth Annual Meeting, Electrical Division, of the Open Pit Mining Association was held at Lexington, Kentucky in cooperation with the College of Engineering and the Department of Mining and Metallurgical Engineering, University of Kentucky.

The meeting was opened with an address by Mr. D. E. Buchanan, Director Industrial Development Kentucky Utilities Company who discussed the growth of coal stripping in the state of Kentucky which grew from 180,000 tons in 1947 to 20,0000,000 tons in 1957. The following was presented at that meeting.

William Schneider, Engineering Manager, Apparatus Repair, Mfg. & Repair Divisions, Westinghouse Electric Corp. reading his paper.

● Ever since the beginning of the Electrical Industry insulation has presented a challenge to the designer. No other single component of any electrical rotating machinery determines its reliability and continuity of service more than the insulation. It is, therefore, one of the essential design components similiar to the magnetic circuits, conductors and the mechanical parts. The electrical insulation is probably also the most expendable part of the machine primarily because of the normal thermal aging effects and other damaging and contaminating conditions to which it is exposed in normal service.

Since the insulation is such an important component of any elec-

Robert T. Taylor addressing the banquet.

trical equipment, it is not surprising that so much attention has been focused on the subject of insulation and that such tremendous efforts have been expended in research and development of new insulating systems. Insulation development not only had to keep pace with the normal advancements made in the industry as newer and larger machines of higher voltage ratings were developed, but it also had to meet the more strenuous requirements which were imposed upon it by the users as they placed this equipment in the many different fields of application.

Fortunately for the users, as well for the suppliers of electrical equipment, the developments in the chemical, resin and electrical industry have enabled the designers to successfully keep pace with other developments and to meet the ever increasing severity of service conditions in all types of industries.

Because rotating electrical machines impose a variety of mechanical, electrical and thermal stresses upon a rather complex insulating structure, the insulation must necessarily be designed to withstand these stresses. Obviously the magnitude of these stresses is a function of the physical size of the machine, the operating voltage, and a number of other design and service factors. Some of the main influencing factors effecting insulation performance of electrical machines can be enumerated as follows:

1. Mechanical damage due to vibration, shock, short circuit forces or loose supports.

2. Thermal aging as related to time and temperature effects.

3. Voltage endurance (failure due to voltage stress as determined by time-voltage effects.

4. Deterioration of insulation components as a result of chemical atmospheres.

5. Erosion by highly abrasive atmosphere.

6. Decomposition resulting from moisture penetration and moisture accumulation.

7. Mechanical damage caused by differential expansion and contraction of copper, iron and insulation.

8. Electrical damage as a result of excessive voltage stresses from lightning or switching surges.

9. Excessive temperature due to abnormal load conditions.

10. Excessive dielectric stress due to abnormal voltages.

11. Reduction in effective creepage distances as a result of conducting contaminents such as salt, dirt, carbon, etc.

12. Excessive vibration due to looseness of the winding caused by shrinkage of the insulation and structural insulating components.

This list of twelve major items influencing the performance of a machine winding is certainly impressive and gives a broad prospective of the problems facing the insulation designer. In general, it is his job to determine which of these influencing factors are most prevalent in the application and then design the insulation to meet these requirements to best advantage. In designing the insulation he must also consider the standard requirements of a well balanced machine design. The insulation components and the composite insulation structure must meet the operating conditions and design characteristics of the machine for a specified operating voltage and temperature. Thus engineers select insulations based on their needs and definitions for their own particular designs of insulating systems for specific equipment. It is important to give recognition to the fact that an insulation system for one type of application may be perfectly satisfactory and be completely inadequate for another type of insulation application.

Most insulations today are integrated systems of several different simple materials such as treated cloth or paper, resinous films and combinations of films with paper cloth or mica. Mica splitings, although they are one of the oldest insulating materials, are still used extensively and are considered one of the most reliable and effective insulations. The major progress in the field of insulation must be attributed to the development of resinous materials which have been made available since the chemical revolution.

It has been accepted practice in the past to consider individual component insulating materials as being the predominent factors in determining the characteristics of an insulation system. Recent developments, experiments and co-ordinated effort in the Electrical Industry sponsored by A. I. E. E. and other Engineering Organizations have indicated the possible fallacy of this type of thinking. It is not the individual component that counts, it is the complete system which determines the characteristics of performance. There are a large variety of insulating materials and in order to develop the optimum properties of these materials, it is essential that they be carefully selected for specific applications and combined with compatible resins to form an integrated insulation system in which all insulating materials compliment each other. This new approach has proven its worth in many applications and it is evident that these systems retain great reliability and long service life.

RECENT DEVELOPMENTS AND NEW MATERIALS

There have been a number of significant contributions in new insulating materials during the last twenty years. One of these materials which certainly must be considered as a major development and an outstanding achievement was the fiberous glass which is used in practically every form of insulating materials. Fiberous glass is found in the form of paper, cloth or tape, laminates and copper wire insulation. Fiberglas has become a widely accepted insulating material because of its

thermal stability, its physical strength, its chemical inertness and non-hydroscopic properties.

Another important contribution to the Electrical Industry was the development of silicone resins. Silicones have made it possible to design rotating machines for operation at extremely high temperatures. Silicones are available in the form of resin, silastic or silicone rubbers and lubricants. All of these materials possess excellent thermal stability at the extremely high temperatures encountered in Class "H" applications.

Other important resin developments have been made and are being used extensively in electrical insulation. Since the end of World War II, such prominent resins as polyesters, epoxies, polyethylene, melomines, fluorcarbons, polyurethanes and many others have become bywords in the insulation field. These resins are typical of the many new types of synthetic materials which have been created through chemical research.

Outstanding among these developments are the co-polymer solventless resins which make it possible to build homogeneous insulating barriers which are essentially void free. Such insulating barriers have high dielectric strength, excellent voltage and thermal endurance, and provide complete isolation of electrical conductors from atmospheric contaminents. The three most notable co-polymers used in integrated insulations are the polyester, the eqoxy, and the recently developed solventless silicone resins. Experience with these materials has opened up new fields and lead the way to further progress in the design of electrical insulation.

Although these resins have outstanding properties as resin films their characteristics are not fully explored unless they are properly combined with compatible insulation materials to form an integrated system. Obviously, new processing methods had to be developed to achieve the desirable end results. The conventional methods of dip coating, brushing or flow coating were satisfactory when better methods were not known, but, in this present day these methods are only used to supplement the main process. Vacuum and pressure impregnation technigues using co-polymer resins to impregnate co-reactive insulating materials such as mica tapes, produce non-porous void free insulating barriers of high dielectric strength which are also impervious to penetration of moisture and other atmospheric deteriorating influences. An outstanding example of an integrated insulation system is Westinghouse Thermalastic insulation which has received world wide recognition by industrial users as an excellent insulation for all types of rotating equipment.

Another example of the use of co-polymer resin is the encapsulating process used to protect windings which are normally exposed to the atmosphere. In this process the resin is especially compounded and applied to the exposed windings in the form of a putty compound until all parts have been completely encapsulated. Epoxy resin formulations have been used extensively for this purpose and experience has proven their performance in many extremely severe applications of moisture and conducting particles. The Westinghouse Coilife treated motor is an example of such a process.

FUTURE DEVELOPMENTS

This discussion would not be complete without taking a look at future trends and developments. Based on experience and the excellent performance of the new integrated insulation systems it can be safely predicted that the trend in insulation development will continue in this direction and that future progress will depend largely on the research developments in the Chemical Industry. The search for improved or new resins having high temperature stability and good physical properties will undoubtedly furnish the key to further advancements.

Mica at the present moment appears to be firmly established as a basic insulating material. Mica splittings continue to dominate practically all of the major insulating fields because of their high dielectric strength, flexibility, thermal stability and resistance to corona attack.

It can also be safely predicted

This McCarthy Auger is drilling 26 inch holes in the Lower Freeport coal which runs 29 inches thick, at the Timblin Coal Co., Timblin, Pa. An average of 155 tons is produced by 3 men, including the driver of the truck which haul- the coal away.

that future insulations will require less space, will be physically stronger and be more stable thermally. Future insulation will be more compact, have higher resistance to chemicals of all kinds, and give greater reliability of service.

Future insulation developments will result from co-ordinated efforts by the Chemical Industry and Electrical Equipment Manufacturers. It should be remembered that large equipment manufactures have, and will continue to make, major contributions to the industry through basic research. They are constantly alert of any major advancements in the art and are continually investigating new processes and materials to improve the performance of their equipment, not only on new machines but on rewinds as well.

It has been requested that a discussion of Glass Polyester Banding of Armatures be included in my presentation here today.

The development of Fiberglas reinforced plastics during the past ten years has made available materials which can be used to band armatures without incurring the hazards to electrical security found in metallic bands. These materials not only have the strength and mechanical advantages of steel bands, including that of application under required tension but also have the added advantage of being insulators and non-magnetic.

The basic material used for this purpose is Fiberglas. Some of the well known properties of Fiberglas are:

Tensile strength —400,000 P.S.I.
Modulies of elasticity —10,500,000 P.S.I.
Creepage —None
Hysteresis —None
Co-efficient of thermal conductivity —7.2BTU/ft2/in/hr./°F

When filled with resin and cured it exhibits excellent electrical properties, its dielectric strength varying between 80 and 600V/mil and its minimum arc resistance—180 seconds.

The Fiberglas used for armature banding is in the form of a tape with the glass fibers laid up in the longitudinal directions only, without cross weave, held together with polyester resin in a semi-cured state. It is made up in various widths all .013" thick in the semi-cured stage. Maximum permissible tensions before curing for the different widths of tape available are as follows:

3/8"—350#	1" — 930#
1/2"—465#	1 1/4"—1170#
3/4"—700#	1 1/2"—1400#

In the application of Fiberglas bands to armatures, it is necessary first to pull the armature coils down into their final position by any approved method now in use, such as, temporary banding, reroll banding, or "squeeze box" followed by driving the armature wedges or sticks in place.

The armature is then heated to approximately 125° C. and placed in a banding lathe. This initial heating has been found by test to be an important step in the process. Test bands placed on a cold armature have been found to relax during the final cure.

The locations of the bands are then determined and where the banding tension requirement is in excess of 200 lbs., restraints are placed around the armature to prevent successive layers of the glass tape from squeezing the underlying layers out of position. This is especially necessary where the band at the pinion end rides almost over the curvature of the coil knuckles.

These restraints are also generally made to the height of the finished band so its thickness can be properly guaged.

Various methods of placing these restraints have been devised. It is also customary, but not necessary, to cover the edges of the band with a serving made of woven glass tape heavily filled with polyester. This covers the somewhat rough and sharp edges left by the layers of the tension taping.

Where the tension band is to

(Continued on page 32)

Uncovering a vein of coal by removing rock overburden is a Model 4500 Manitowoc dragline. The 5 1/2-yard unit is owned by Black Tam Mining Company and is working in the company's strip mine near Wheatcroft, Kentucky.

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Undivided Responsibility...

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Keep your equipment all in the Caterpillar family and profit many ways: operators and servicemen become familiar with one brand of machines. There's a similarity in operation, servicing and maintenance. And operators prefer Cat machines because they're the big producers—and everyone wants to ride a "winner." Result—he produces more—and makes you more money.

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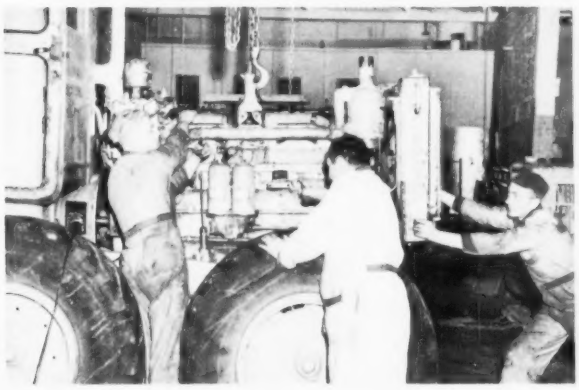
Standardizing on Cat equipment reduces your parts inventories, since many parts are interchangeable. One dependable source—your Caterpillar Dealer—supplies all your parts needs. His parts stocks are based on machine population in his territory, double-checked by a modern inventory control system—so you can always depend on prompt service.



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brings you the best in service

Only Caterpillar Dealers give authorized Caterpillar service. Servicemen are factory-trained to handle work quickly, correctly, and with your best interests in mind. They are equipped with complete service facilities: labor-saving tools, shops with modern equipment, and trucks completely outfitted for efficient, on-the-spot field service. What's more, Caterpillar Dealers conduct "Cat Care" training programs to help your servicemen become more efficient . . . to save . . . earn you more money.

turn the page for more tips on how undivided responsibility saves you money . . .

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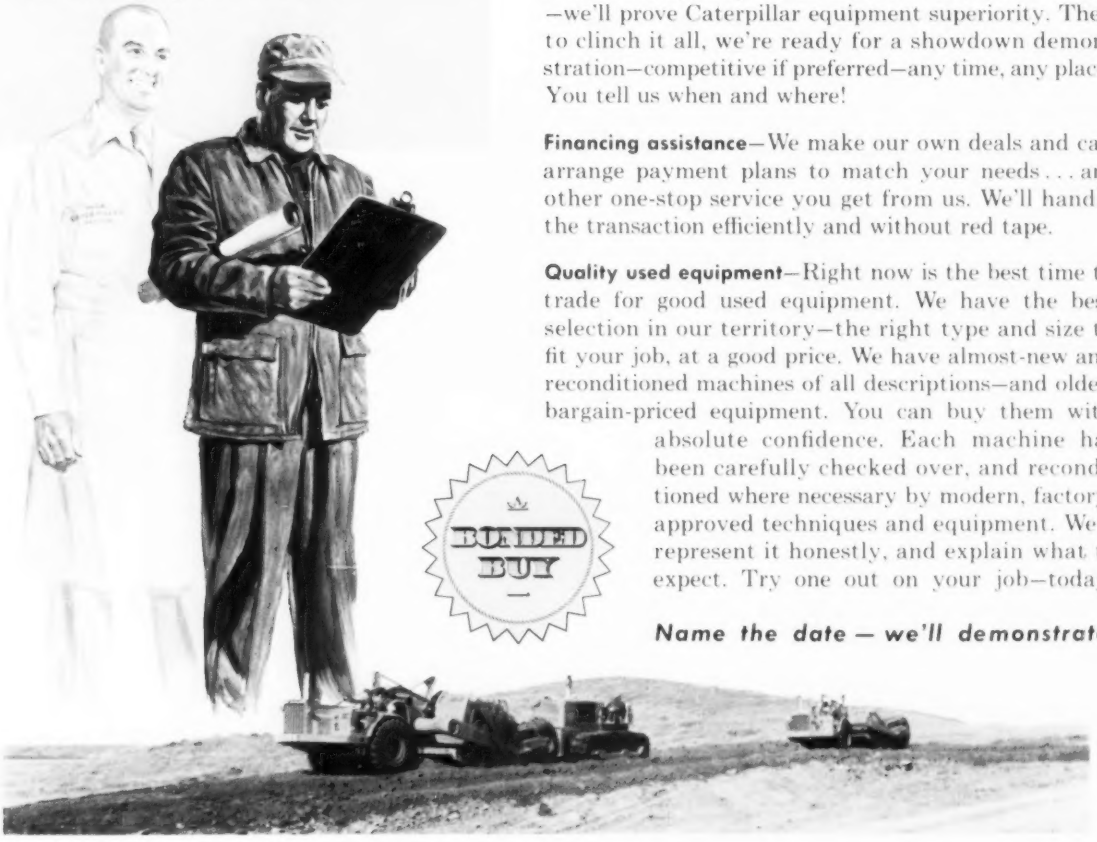
to match your needs



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WAKE UP, COAL INDUSTRY

● Man is breaking with set limitations and safeguards of the past: his gains are now much greater and so are his risks. Man is on the very edge of a new relation to the universe in which he finds himself. This new relation is placing greater demands on his mental capacity, and on his other resources, in order to handle new powers with wisdom and with decency.

Man's industrial revolution, and his other historical instances of great social change, are going to be totally dwarfed. The magnitude of the changes are going to be more compelling and will pose more urgent problems.

One problem of man, in connection with his industry, will be his relation to science and his formulated policies. In industry, science is becoming vitally involved in man's policies. But the special knowledge which science brings will be powerless, even dangerous, if that knowledge is not effectively pooled with knowledgeable contributions of the industrial engineer and brought to serve all segments of society. In the coal mining industry, the time is overripe for a more understanding collaboration between scientific knowledge and management. Due to this backwardness of management in applying latest scientific knowledge to its operations, the coal mining industry is far behind its competition which has applied scientific means of operation and the rapidity in which it is losing markets is accelerating.

Hard at work at Perry-Ross Coal Co., Harlansburg, is this new Allis-Chalmers HD-21.

Modern equipment a necessity for successful coal stripping

In the constant struggle against rising costs and increased competition, modern equipment is the most important ally of the successful coal stripper. This is particularly true as the higher coal seams are worked out and overburden depths increase.

Typical of leading coal producers that recently have added larger capacity, up-to-date machines are four western Pennsylvania firms. These are Keystone Valley Coal Co., New Castle; Perry-Ross Coal Co., Harlansburg; William Fiore, Russelton, and P & N Coal Co., Punxsutawney. All are now operating new Allis-Chalmers tractors sold by Highway Equipment Company, Pittsburgh.

Although almost half buried in muck, Perry-Ross HD-21 carries full load on bulldozer blade.

Allis-Chalmers HD-21 cleans up around dragline at Keystone Valley Coal Co. mine near New Castle.

Moving large rock away from dragline bucket is part of typical day's work for Keystone Valley's HD-21.

Looking down on backfilling pattern at P & N Coal Co.

Last job on every stripping project — backfilling — requires efficient, heavy duty equipment like this HD-21 at P & N Coal Co., Punxsutawney.

HD-11 grabs a full bucket of coal at William Fiore's stockpiling operations in Russelton.

A fast cycle from stockpile to truck is completed by Fiore's HD-11.

DOES THE SHOE FIT?

By C. G. Reider
Sales Development Div., Caterpillar Tractor Co.

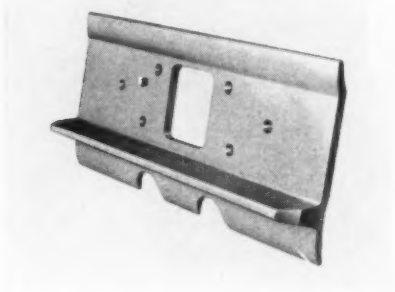
Matching right size and type of track shoe to job pays off in increased production and longer service life. Here's important information for owners of crawler tractors.

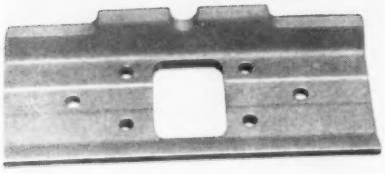
Ground conditions dictate the choice of track shoes. A cohesive soil like clay, for example, requires a grouser-type shoe which will provide flotation, traction and resistance to bending or breaking. When shoe width is increased, flotation and traction are improved. Wide track shoes do, however, increase the wear on track components and the possibility of track shoe damage. Use only the width necessary for good flotation.

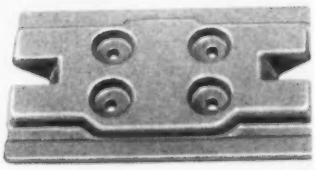
A frictional soil, like pure sand, has a different set of requirements. Since the soil has no cohesive strength, traction depends entirely on the weight of the machine resting on the tracks. A flat or grouser-type shoe with only enough contact area for good flotation should be used.

In rocky area, the recommendation for track shoes is in sharp contrast to those specified for work in soil. The prime consideration is for a shoe that will resist wear and breakage, since flotation is no problem. The type of shoe that will work best depends on the size of the tractor and the type of rock in which it is required to operate. When a tractor must operate exclusively on smooth quarry or mine floors, a flat shoe should be used because of the wear resistance afforded by the large contact area. When the tractor operates in broken rock, a multi-grouser shoe should be used. These shoes have a higher resistance to wear than a standard single grouser and still retain good traction characteristics. The multiple grousers effectively cross brace the shoes to make them less susceptible to bending and cracking under impact. In either case, no wider shoe should be used than is needed for traction.

There are many jobs, such as logging or snow removal, that require a tractor to operate in ice or snow. Good grouser penetration is necessary to provide sufficient







UPPER LEFT

CENTER PUNCHED GROUSER SHOE is used for snow conditions where traction and flotation are needed. Center punched hole helps prevent the snow from packing between track components. This shoe has advantages as a semi-skeleton shoe but is stronger in non-snow operations.

LOWER LEFT

SEMI-SKELETON SHOE has alternate single and doubled sharpened spikes on grousers to give good penetration and prevent side slips when operating on ice or hard packed snow. The hole in center allows snow to slip through without packing in track. This type shoe provides good flotation and strength.

UPPER RIGHT

SKELETON SHOE is used on smaller tractors which must work at varied jobs. It is primarily a base on which ice or dirt grousers may be attached. Because of its skeletal structure it has excellent self-cleaning action for snow applications.

LOWER RIGHT

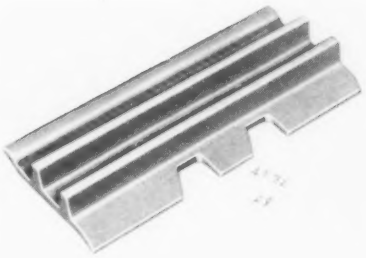
FLAT SHOE is designed especially for tractors which spend much time on smooth road surfaces, pavements or rock, or must perform considerable turning. These shoes have a large contact area for low penetration and low turning resistance. When used in dirt a detachable grouser may be installed.

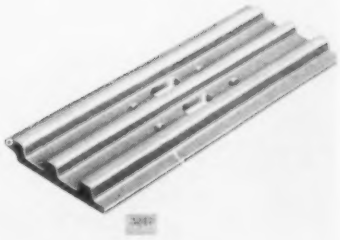
RUBBER SHOE provides good traction on pavement, factory floors and platforms. Designed for small tractors these shoes prevent scarring during turns.

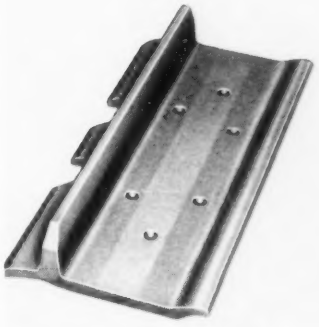
traction when working on ice, although flotation is no problem. In loose snow, good flotation and self-cleaning action are important, but grouser penetration need not be considered. Semi - skeleton - type shoes are designed to meet these conditions and are available in a wide range of modifications.

Small tractors often use rubber shoes in industrial applications. This type of shoe provides good traction on pavements, factory floors and platforms, and prevents scarring floor surfaces on turns. If a machine is to be operated only temporarily on pavements, a street plate attachment can be installed over the grouser shoe to prevent damage to the road surface.

In grouser shoe applications where flotation is needed, but side clearance is a problem, offset shoes are used. Shoes may be offset either to the inside or outside of the track chain centerline, depending upon the need. Inside offset shoes are used on bulldozer-equipped tractors when flotation is required and clearance is necessary to keep the shoes from hitting the C-frame or push arms. Inside offset shoes are also used when pusher tractors require flotation, and the shoes must remain inside the scraper cut. Outside offset shoes are used when extra flotation is needed and tractor frame interferes with use of larger width shoes. Resistance to bending, however, will be lowest on the overhanging side.







UPPER LEFT
DOUBLE GROUSER SHOE is used for operation in rock on larger tractors. The double grouser provides more contact area and greater resistance to bending and breakage than single high grousers. This type shoe also helps the tractor turn more easily.

LOWER LEFT
GROUSER SHOE is designed for operation in dirt or other granular materials. Width narrower or wider than standard can be installed depending on the amount of flotation or penetration desired.

UPPER RIGHT
TRIPLE GROUSER SHOE is used for multi-purpose conditions. This shoe is designed to give good traction in soft materials, but still retains the advantages of the flat and flat center shoe. It has high resistance to breaking or bending and allows limited track slippage to reduce wear on the tractor's power train.

LOWER RIGHT
FLAT CENTER SHOE gives greater strength and penetration than the flat shoe. Designed for use in broken rock and similar materials, this shoe provides good traction in soft materials. A detachable grouser can be installed for use in dirt work.

● A new heavy duty combination air blast and mud fluid rotary drill is announced by Davey Compressor Co., Kent, Ohio.

Designated as Model M-7WA, it is reputed to be suitable for gas, oil and water well drilling, as well as all types of exploratory and core work in mining and construction. The rig has rated capacity in excess of 3,500 ft. with $2\frac{7}{8}$-inch pipe and 2,500 ft. with $3\frac{1}{2}$-inch pipe.

An outstanding Davy M-7WA feature is its wide hydraulically-operated mast. This has a working capacity of 50,000 lbs. and can handle 20-ft. lengths of drill pipe. Mast is lowered for over-the-road travel.

The unit is equipped with a Davey 600W air compressor, delivering 600 c.f.m. at pressures up to 100 p.s.i. Mud pump is a Wheatly Model 6070, piston type, 7 x 10 inch. Operating power can be secured direct from the truck engine through a Davy 500 power take-off, or by use of a separate power source.

Draw works are of the drum-over type. Capacity is 16,000 lbs. each. Drums carry 425 ft. of $\frac{5}{8}$-inch or 2,250 ft. of $\frac{3}{8}$-inch wire rope.

Minimum effective brake area is 275 sq. inches. The 3-speed, heavy-duty rotary table has an 8-inch opening. Swing-out design permits setting of 30-inch casing without moving rig.

Weight of the M-7WA on a standard truck, with power take-off, is 25,500 lbs.

For complete M-7WA details, together with data on 8 other standard Davey rotary drills, write for Catalog E-270. **Davey Compressor Co., Kent, Ohio.**

J. F. Docherty,
Highway board chairman

Highway Equipment Company Marks 25th Anniversary

D. L. Reynolds,
Highway Equipment Company president

Truth of the adage "strength is born of adversity" is proved by the history of Highway Equipment Company, Pittsburgh.

This distributor, one of the nation's largest suppliers of coal mining equipment, is now celebrating its 25th anniversary.

And, as its founders, D. L. "Lee" Reynolds and J. F. "Doc" Docherty, survey their 2 plants in Pittsburgh and Du Bois, with 168 employees.

The Highway sales staff. (Back row, left to right) W. J. Devine, Jack Janssen, George Meiklejohn, Sales Manager J. J. Janssen, Sr., K. O. Shaner, W. P. Vogel, L. G. Lenz. (Front Row) A. P. Sabolovic, T. R. Helsing, Frank Chase, John F. Moorhead, L. J. O'Toole, W. M. Keelan, H. J. Sichi. Representatives absent from photo are E. W. McDonough, and C. H. Osborne.

J. J. Janssen, Sr., sales manager

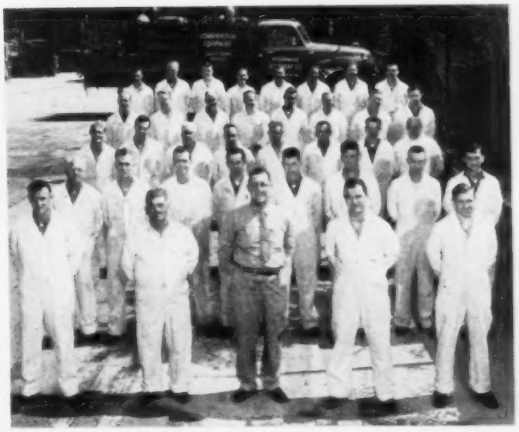
they are probably inclined to look back at the dark days of 1933 and wonder how they had guts enough to launch their new business in the depths of America's worst depression.

Close friends of many years standing, Reynolds and Docherty resigned positions with Lakewood Engineering Co., a division of Jaeger Machine Co. to form Highway at a time when equipment could scarce be given away let alone sold.

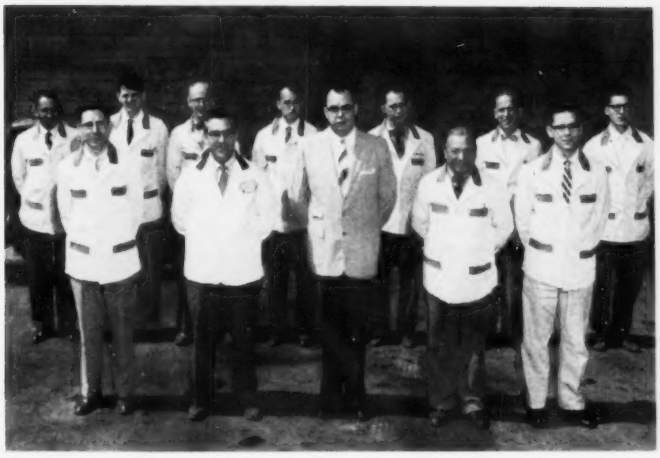
Highway today is a prosperous, growing organization. Its 35,000 sq. ft. Pittsburgh plant is situated on a 3-acre plot at 6465 Hamilton Avenue.

At 40 Hoover Avenue, Du Bois, its new branch has a 15,000 sq. ft. display, service and parts building in the midst of 2 acres.

Part of Highway service truck fleet.



Highway service crew, Pittsburgh plant. Ernie Sarver, shop superintendent, is in center front.

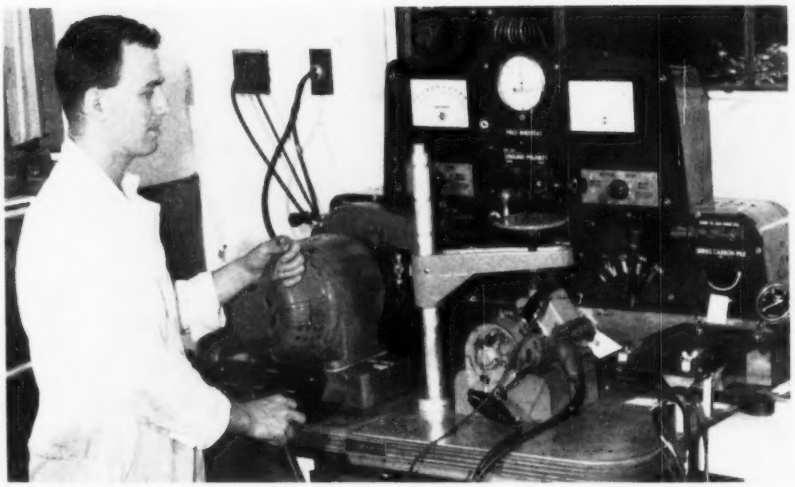


Pittsburgh parts department staff with Al Bischoff, parts manager, in center front.

Highway's parts department meets the needs of every customer.

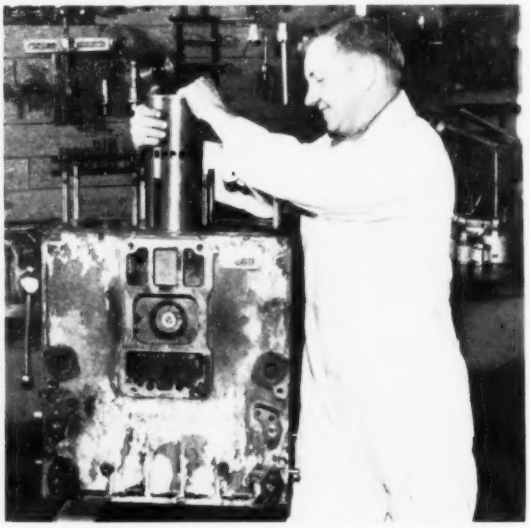
Highway sales have increased every year since its founding. 26 service trucks rush about Western Pennsylvania, helping to keep wheels of the coal industry moving steadily without interruption. 37 service experts in Pittsburgh, 7 in Du Bois handle repair and maintenance work promptly and efficiently. Shops are equipped with modern testing apparatus, instruments and tools . . . everything needed for jobs ranging from simple tuneups to major overhauls or rebuilding to strict manufacturers' standards.

Parts requirements of customers are filled by a staff of 12 in Pittsburgh, 4 in Du Bois.

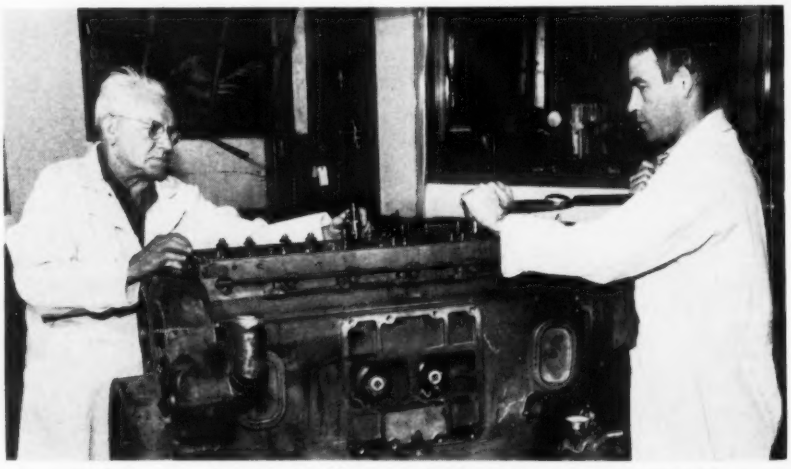


Highway's technical diesel laboratory is one of the country's most modern and complete. Photo shows generator and starter testing equipment.

Allis-Chalmers diesel injection pump testing stand.



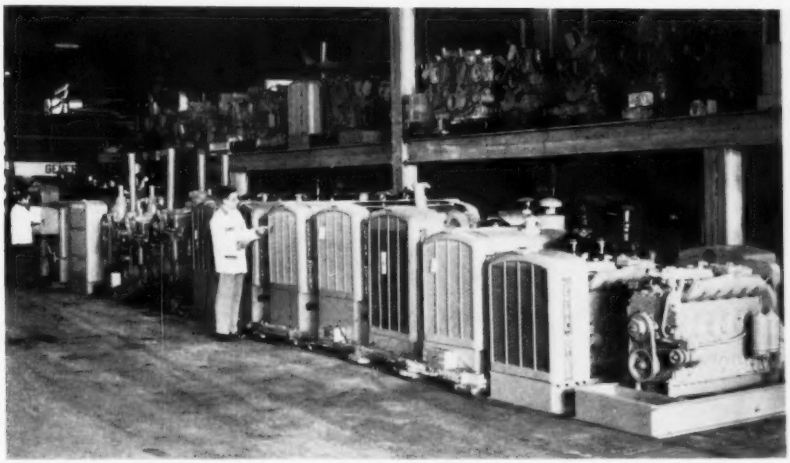
Installing GM cylinder sleeve assembly.



Highway is equipped to handle every diesel maintenance and repair job

However, main strength of the Highway organization lies in its group of 18 experienced salesmen, more appropriately known as equipment engineers. Each of these men possesses a broad background of mining or construction experience and has been trained in manufacturers' plants, as well as in Highway's own equipment school.

Highway representatives, by contrast with many equipment salesmen, in addition to selling, actually survey jobs and make recommendations as to what type of machinery



Section of engine warehouse.

Jack Docherty, Du Bois branch manager.

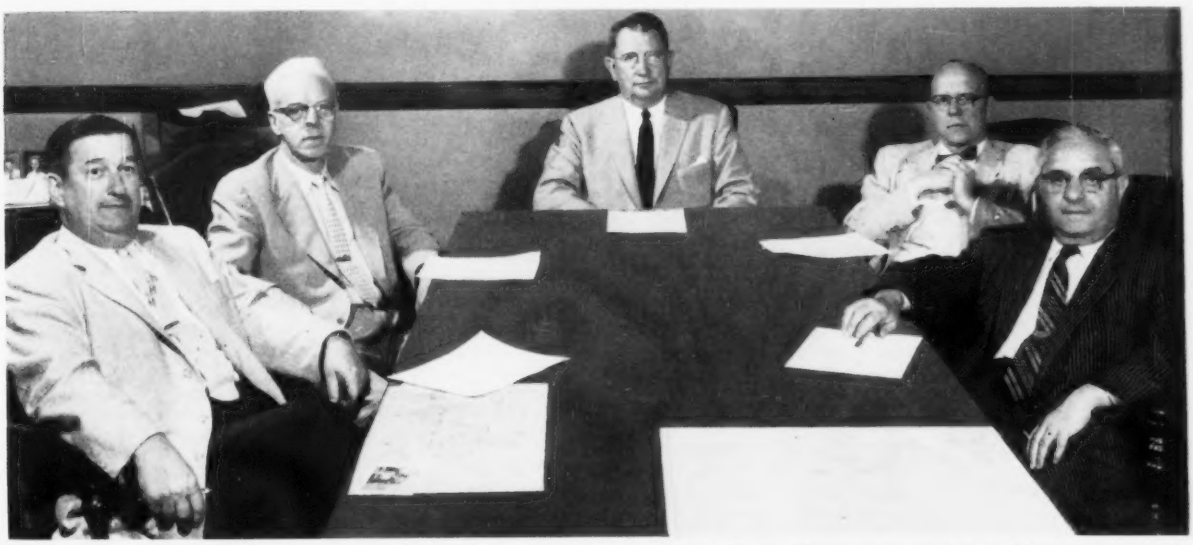
will do the work fastest and most economically. There is, of course, no charge or obligation on the customer's part for this service.

Also, Highway, when it sells a piece of equipment, backs the manufacturer's warranty with its own iron-clad guarantee. Therefore, customers can be certain that they are not only using the most efficient, modern equipment, but that local service is immediately available on it.

Now, in Highway's 25th birthday year, Lee Reynolds, president, and Doc Docherty, board chairman, are still the principal moving forces behind the company's operations. However, over the years, they have assembled a staff of experienced executives, each of whom handles an individual phase of Highway's work. This group includes A. R. Dalessio, vice president in charge of purchases, with Highway since 1933; N. F. Sarver, vice president in charge of production, who joined Highway in 1934; D. R. Knight, executive vice president, a Highway veteran since 1936, and Sales Manager J. J. Janssen who joined the firm in 1945. Other officials are E. S. Shannon, secretary and treasurer, and Frank Chase, manager, diesel engine division. Both have been with Highway since the early '40s. Jack Docherty is manager of the Du Bois branch.

Equipment lines, handled by Highway, include products of many of the nation's leading manufacturers. Among these are Allis-Chalmers tractors, tractor - shovels, scrapers and graders; Jaeger air compressors, pumps, concrete and plaster mixers; Gar Wood ditchers; Lima shovels, cranes, draglines and Roadpackers; Thor air tools; Michigan tractor shovels and excavator-cranes; Master concrete vibrators and finishing equipment; General Motors diesel engines, and others.

In addition to the sale of new equipment, Highway enjoys a flourishing business in used and rebuilt units. The company also rents equipment of all types for either short or long periods as required.



The Highway executive board. Left to right, N. F. Sarver, vice president; E. S. Shannon, secretary and treasurer; D. L. Reynolds, president; D. R. Knight, executive vice president, and A. R. Dalessio, vice president.

"Talk up" increased production—greater safety...with these M-S-A COMMUNICATION SYSTEMS

M-S-A MINEPHONE

Dispatcher sends orders instantly and simultaneously to all motormen with this modern, underground two-way voice communication system. Motormen receive and reply while trips are in motion—keep haulage movements coordinated with production demands. This results in smoother, faster, and more continuous trip movements throughout the mine.

Messages clear tracks for outgoing loaded trips and incoming empties. This system puts an end to traffic tie-ups, errors and accidents; prevents excessive stop-and-start strain on equipment. Write for more detailed information.

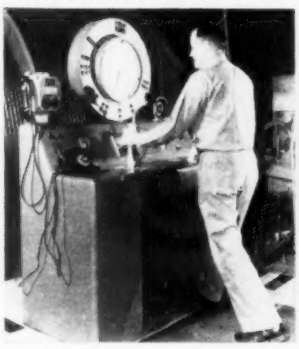
• Dispatcher sends orders to motormen . . . routes right-of-way traffic . . . receives reports on positions and station conditions.

• "Jeep" operator requests instructions from dispatcher and maintenance shop for section assignment . . . speeds emergency repair

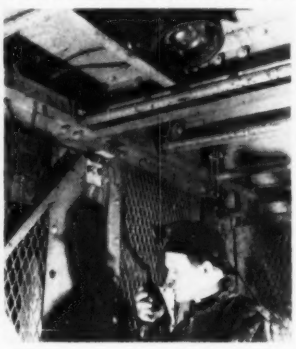
M-S-A HOISTPHONE

For accurate, instant response between the hoisting engineer and cage, here's the voice communication system to install. Whatever the job—load leveling—shaft repairs—shaft inspection trips—passenger transportation—the M-S-A HoistPhone provides better safety and efficiency through dependable, continuous two-way voice communication at any level, and while the cage is in motion.

Requires no special training . . . simple to use . . . dependable in operation. Write for further information.



• The hoisting engineer is able to control all movements of the cage by communicating with cage rider over the M-S-A HoistPhone.



• Worker uses microphone in cage to tell the hoisting engineer where he wants to go. Loudspeaker mounted on top of cage.

M-S-A

SAFETY EQUIPMENT HEADQUARTERS

When you have a safety problem, M-S-A is at your service . . . our job is to help you

MINE SAFETY APPLIANCES COMPANY

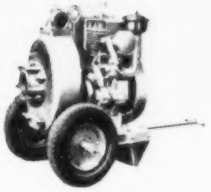
201 North Braddock Avenue, Pittsburgh 8, Pa.

At Your Service: 77 Branch Offices in the United States and Mexico

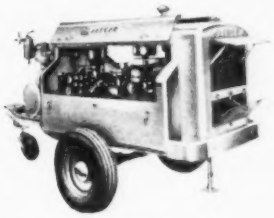
MINE SAFETY APPLIANCES CO. OF CANADA, LTD.

Toronto, Montreal, Calgary, Edmonton, Winnipeg, Vancouver, Sydney, N.S.

HOW JAEGER EQUIPMENT LOWERS COSTS



Jaeger "Sure Prime" pumps are engineered with oversize shells and impellers and engines of the largest horsepower applicable. They pump full volume at 300 to 450 rpm slower average speed than ordinary pumps, thus giving long life and notable fuel economy. (The 6-inch diesel powered pumps shown in photo had been pumping 24 hrs. a day, 9 months a year for 3 years in Pennsylvania strip mine when photographed.)



Jaeger "Roto Air Plus" compressors deliver full rated capacity when operating at 100 to 350 rpm slower speeds than ordinary rotary compressors. Full load speed in a Jaeger 600, for example, is 1650 rpm compared with 1800 in all others, all using the same GM Model 6-71 diesel engine. Other sizes—125 and 250 on 2 wheels, 365 on 4 — comparably efficient.

Sold, rented and dependably serviced for 25 years by

HIGHWAY EQUIPMENT COMPANY

6465 Hamilton Avenue, Pittsburgh 6, Pennsylvania • 40 Hoover Avenue, Du Bois, Pennsylvania

ELECTRICAL INSULATION

(Continued from page 16)

cover large gaps between the armature coils it is also necessary to cover these gaps with strips of .015" thick laminate.

The bands should be wound on with sufficient tension to stretch them somewhat more than they would be by the centrifugal force. This pulls the coils down into their final position and arch binds the end turns thus preventing coil movements due to changes in speed. Generally such tension is determined from the original steel band design which specifies wire size, number of turns, as well as tension. For steel wire bands in Westinghouse railway motors, the following table has been developed:

Wire Diameter	*Single Band*	*Double Band (Upper Layer)*
.029	90 lbs.	60 lbs.
.045	225 lbs.	150 lbs.
.057	350 lbs.	250 lbs.
.064	400 lbs.	300 lbs.
.072	500 lbs.	400 lbs.
.081	600 lbs.	500 lbs.

Because of the multiplicity of layers in Fiberglas banding the tension used corresponds to the upper layer of the steel wire.

A tension device that is suitable for winding the Fiberglas tape on an armature is used by all Westinghouse Apparatus Repair shops and is capable of applying the Fiberglas bands at tensions up to 600 lbs.

Incidently, this device is suitable for applying either wire temporary bands or Fiberglas reinforced plastic tape for final banding.

Because of the difference in ultimate strength the Fiberglas band cross section is approximately twice the cross section of the steel wire band. This is determined from the ultimate strength of the composite Fiberglas and Polyester resin which is 120,000 P.S.I. at room temperature and between 85,000 P.S.I. and 100,000 P.S.I. at the maximum operating temperature of the band, as compared to 220,000 P.S.I. for stainless steel with a proportional limit of 175,000 P.S.I.

When each tension band is completed the end of the tape is secured by applying a hot iron to the section just prior to the point of severence. This accelerates the polymerization of the end of the tape just enough to cause it to adhere to the body of the band. The tape can then be cut off without danger of unwinding.

When a smooth glossy surface of the band is desired it is covered with one or two layers of woven tape impregnated with polyester. This is the same tape used for serving of the edges.

After the bands are applied they should be covered by a brushed on coat of varnish to prevent air inhibition and then baked at 125° C. (255° F.) for four to six hours to fully cure the polyester resin. After final dipping and baking the armature is then ready for balancing.

The location of balancing weights proceeds as is customary for conventionally banded armatures in a suitable dynamic balancing machine. Two general methods of securing the necessary weights to the bands are being used. In one an epoxy filled compound is used. This compound has about 60% of the weight of lead. It is mixed with a catalyst immediately prior to use and placed on the band in the required amount and location and set aside to air cure which occurs in one or two hours.

In the second method, small pieces of copper plated lead 1/16" thick are cut to suitable size and weight and are cemented to the band with the use of high strength adhesives. One such adhesive is composed of a suitable epoxy catalyzed just before use. This adhesive cures at room temperature in one to two hours, although it does not obtain its maximum strength for twenty-four hours after application. In each of these cases the varnish should be sanded off the part of the band to which the adhesive and weight is to be applied and in the case of the use of sheet lead weights it is necessary to use copper plated lead since the plain lead causes inhibition of the adhesive even when thoroughly cleaned of lead oxide and surface contamination.

Still another method of balancing is to balance the armature before the Fiberglas bands are applied and to cut the necessary balance weights from sheet lead and locate them on the armature. Such weights are placed on a flexible mica pad about ½" wider and longer than the sheet lead and wrapped into the Fiberglas band after two or three layers are wound on the armature.

Placing balance weights on the bands on armatures should be avoided as far as possible. Most modern armatures are provided with grooves for the attachment of weights to the armature and commutator spiders and where such are not found, balancing the core before winding will keep the amount of weights to be added to the bands to a minimum.

After balancing, the armature generally receives a final coat of air drying varnish before installation in the motor or generator.

● A new 16 millimeter sound film in color, showing operations of its Model M8 Rotary Drills, has just been produced by Davy Compressor Co., Kent, Ohio.

Movie prints are available for showing before association meetings, conventions, trade groups, etc., according to L. W. Darling, general sales manager. The film is approximately 20 miniutes in length It shows Davey drills working in strip mines, quarries, highway construction job and in water well drilling.

Davey rotary drills are manufactured in 9 models with rated capacities to 3,500 ft.

D9's stay ahead of 6-yd. drag, strip 70% of 60-ft. overburden

Two cat D9 Tractors are stripping 70% of the 60-foot overburden on this Farbizo Coal operation in Tuscarawas County. Staying well ahead of a 6-yard dragline which skims off the remaining overburden, the two fast-moving D9's have substantially trimmed Farbizo's stripping time and costs.

"Our D9's move more dirt faster than any tractors I've seen," says Owner Clarence Farbizo. "Our boys say the D9 is easy to operate, too. All around visibility and power-boosted controls hold down fatigue and get us top production all day long. And our experience shows we can count on just that kind of production."

The big 320 HP D9 has plenty of power for any stripping or reclamation job. It's easy to service, too —torque convertor or direct-drive transmission and steering clutches can be serviced without removing other components.

Want to lower your stripping costs? Call us.

OHIO MACHINERY CO.

6606 SCHAAF ROAD
CLEVELAND 9, OHIO
LAfayette 4-2911

930 KINNEAR ROAD
COLUMBUS 16, OHIO
HUdson 8-9703

2807 REYNOLDS ROAD
TOLEDO 6, OHIO
JOrdan 3701

4000 LAKE PARK ROAD
YOUNGSTOWN, OHIO
STerling 2-8161

U. S. ROUTE 250
CADIZ, OHIO
Cadiz 465

PROFIT SHARING FOR EVERYBODY!

We share our profits with those from whom we buy and to whom we sell, by passing on the savings of a large scale, diversified operation.

That's why we pay year round FAIR prices for any kind and quantity of mining equipment from one item to a complete mine ANYTIME.

That's why we guarantee coal operator's an unfailing source of the BEST in mining equipment at the LOWEST prices always!

WE BUY — SELL — TRADE

JOY EQUIPMENT—REBUILT

3—Joy 14-BU Loaders, low pedestal, 7AE.
2—Joy 14-BU Loaders, medium pedestal, 7RBE.
1—Joy 14-BU Loader, high pedestal, 7BE.
2—Joy 12-BU Loaders, 9E, latest type.
1—Joy 12-BU Loader, 220 Volt AC.
1—Joy 20-BU Loader, latest type.
1—Joy 11-BU Loader, latest type.
2—Joy 8-BU Loaders, 250 volt DC.
1—Joy 8-BU Loader, 34" overall height.
2—Joy 8-BU Loaders, 220 volt AC.
1—Joy curved Bar Head, complete.
6—Reliance 38-J Motors, 10 H. P.
6—Reliance 24-J Motors, 7½ H.P.
4—Reliance 10-J Motors, 5 H. P.
20—9-J Motors, 4 H.P.
6—New Wheel Units for Joy 6 SC Shuttle Cars.
1—Goodman 660 Loader on cats, excellent.
1—Goodman 665 loader on cats, latest type.
2—Joy 8SC Shuttle Cars, rebuilt.
2—Joy 6 SC Shuttle Cars, rebuilt.
2—Joy 5 SC Shuttle Cars, rebuilt.
2—Joy 32E9 Shuttle Cars.
2—Joy 32E10 Shuttle Cars, rebuilt.
2—Joy 32E15 Shuttle Cars, rebuilt.
1—Joy 32E16 Shuttle Car, rebuilt.
2—Joy 42E16 Shuttle Cars, rebuilt.
3—Joy CD-22 Drills, like new.
4—Joy T-2-5 low pan Cat Truck.
1—Joy T-2-6 low pan Cat Truck with reel.
2—Joy T-1 Standard Cat Trucks, 220 AC.
1—Joy T-1 Standard Cat Truck, 250 DC.
2—Joy 11-B Cutting Machines, like new.
1—Joy 7-B Cutting Machine, like new. 250 Volt DC.
2—Joy 7-B Cutting Machines, 220/440 volt AC.
1—Goodman Machine on Cats, 31" high. All hydraulic.
6—Goodman 512 machines, with Bugdusters.
1—Goodman 512 cutting machine, perfect.
4—Goodman 512 cutting machines 220/440 volt AC.
3—Goodman 112 Cutting Machines, 220/440 volt AC.
1—LeeNorse low vein Machine Carrier on rubber.
2—Jeffrey 70 URB's, rubber-tired Cutters, Universal head, perfect condition.
1—Joy 10 RU Rubber-tired Cutter, first class.
1—Joy 11RU, rubber-tired Cutter with bugdusters, Universal head, like new.
2—Jeffrey 29UC Cutting Machines, Universal head, cuts anywhere in seam, 38" high, on cats, 250 volt DC.

LOCOMOTIVES

3—Jeffrey 13 ton, type MH-110, 36", 42" and 44" Ga.
2—Jeffrey 10 ton, type MH-110, 42" and 44" Ga.
1—Jeffrey MH-124, 6 ton, 24" overall height.
12—Jeffrey, 6 ton, type MH-88, 42", 44" and 48" Ga.
2—Jeffrey, 8 ton, type MH-100, 2" armor plate frames.
1—Jeffrey, 6 ton, type 2186, 22" above rail.
3—Jeffrey, 4 ton, type MH-96, 42", 44" and 48" Ga.
1—G. E., 4 ton, type 825 Locomotive, 22" high.
10—G. E., 6 ton, types 801, 803, 821 Locomotives, 42", 44" and 48" Ga.
1—G. E., 8 ton, type 822 Locomotive, 44" Ga.
3—G.E., 10 ton, type 809 Locomotives, 42", 44" and 48" Ga.
2—Goodman, type 33, 6 ton, 44" and 48" Ga.
3—Goodman, 8 ton, type 32A, 36", 44" and 48" Ga.
3—Westinghouse, type 902, 4 ton, 42" and 48" Ga.
2—Westinghouse, type 904, 6 ton, 44" and 48" Ga.
2—Westinghouse, type 906, 44" and 48" Ga.
2—Westinghouse, type 907, 10 ton, 44" and 48" Ga.
8—Jeffrey MH-78 Locomotive Units, cheap.
3—Plymouth Diesel Locomotives, 8 and 10 tons, 42 in. and 44 in. Ga.

LOCOMOTIVES (Cont.)

4—Jeffrey MH-88 Locomotive Units, real bargains.
6—Jeffrey MH-100 Locomotive Units, reasonable.
Locomotive Trucks and Spare Armatures for all the above.

TIPPLE EQUIPMENT

1—Cedar Rapids portable super Screening Plant.
1—Complete 5 track tipple with washer.
1—Allis Chalmers 5'x14' Rippflo Vibrator.
1—5'x14' Robins double deck Vibrator.
1—4'x10' Robins Gyrex Vibrator.
1—Roberts & Schaefer tandem Hydro-Separator. Belt Loading Boom.
1—Robins Car Shakeout.
10—Crushers, various sizes.
Feeders, Drag Conveyors and Loading Booms.

CUTTING MACHINES

1—Joy 11RU, rubber tired, Cutter.
1—Joy 10RU, rubber tired Cutter.
2—Jeffrey 70URB Cutters, rubber-tired, Universal Head, low vein.
3—Jeffrey 29UC Universal Machines on Cats.
1—Goodman on Cats, 31" overall height.
3—Baby Goodman 212's, rebuilt, 250 volt DC.
1—Baby Goodman 212, rebuilt, 220 volt, 3 phase AC.
1—Goodman 312, 18" high.
6—Goodman 512's with Bugdusters, like new.
4—Goodman 512's, rebuilt, or as removed from service.
4—Goodman 512's, 220/440 volt AC.
3—Goodman 112's 220/440 volt AC.
1—Jeffrey 35-L Cutting Machine, 220/440 volt AC.
2—Joy 7-B Cutting Machines, 220/440 volt AC.
2—Joy 11B Cutting Machines, rebuilt.
6—Goodman 12AA's and 112AA's, 250 Volt DC.
2—Goodman 324 Slabbers.
2—Goodman 724 Slabbers.
6—Jeffrey 35L's, like new, 17" high.
2—Jeffrey 35L's, on low vein trucks.
1—Jeffrey 35L, 220 volt AC.
15—Jeffrey 35B's and 35BB's.
2—Jeffrey 29B's on track.
2—Jeffrey 29C's track mounted.
1—Jeffrey 29L on track, perfect.
2—Sullivan CR-10's, 15" high.

LOADING MACHINES

16—Loaders, all types.
2—Jeffrey 61 CLR's on rubber, 26".
3—Jeffrey L-500 Loaders.
2—Myers Whaley No. 3 Automat Loaders.
2—Clarkson Loaders, 26" above rail.

CONVEYORS

1—Jeffrey 52-B, 30 in. Conveyor, 1,000 ft. Excellent.
4—Joy 30" Underground Belt Conveyors, 500' to 2000' each. Excellent.
1—Barber Greene 30" Belt Conveyor, 1000'.
1—Robins 30" Belt Conveyor, 1000'.
1—Jeffrey 52-B, 26 in. Conveyor, 1200 ft. each.
3000' Conveyor Belt, 30".
2—61EW Elevating Conveyors
2—61WH 15" Room Conveyors, 300 ft.
2—Joy 15" Room Conveyors, 300'.
2—Joy 20" Conveyors, 300'.
4—Joy Ladel UN-17 Shakers.
10—Goodman G-12½ and G-15 Shakers.
2—Long 400 DBH 15" Chain Conveyors, 25 H. P. Motors, new.

CONVERTERS AND DIESEL PLANTS

1—300KW Westinghouse Portable Rectifier.
2—100KW, G. E. TCC-6's, 275 volt, Rotary Converters.

Converters and Diesel Plants (Cont.)

1—150KW, G. E. HCC-6, 275 volt, Rotary Converter.
1—150KW, 6 phase, Allis Chalmers Rotary Converter, 275 volt DC, perfect.
1—200KW Allis Chalmers, Rotary Converter 6 phase, 275 DC, perfect.
1—200KW, G. E. HCC-6 Rotary Converter, 275 volt DC.
3—300KW, G. E. HCC-6 Rotary Converters, 275 DC.
3—300KW Westinghouse, 6 phase, Rotary Converters, 275 volt DC.
1—375KW Westinghouse Rotary Converter, 275 volt.
2—500KW Westinghouse Rotary Converters, 275 volt DC.
1—200KW Westinghouse Rotary Converter, 275 DC.
(all the above with 6900/13000 and/or 2300/4000 primary transformers)
2—150KW MG Sets, General Electric and Westinghouse.
1—200KW MG Set, Westinghouse, rebuilt.
1—200KW MG Set, General Electric, perfect.
2—150KW Allis Chalmers MG Sets, 275 DC volt, excellent, 220/440 AC volt.
1—300KW Westinghouse, 600 volt MG Set, rebuilt.
2—300KW Westinghouse, 600 volt, 6 phase, Rotary Converters.
4—500KW Westinghouse, 600 volt, DC, 6 phase, Rotary Converters.
2—500KW HCC-6 Rotary Converter, 6 phase, 600 volt DC.
1—Cummins 125 KW, Diesel with 250 volt DC Generator.
1—G. M. C. Diesel Plant with 60 KW Generator, 275 volt DC.
1—Allis Chalmers Natural Gas Engine with 100KW Generator, 275 volt DC.
1—700 H. P. Shaft Hoist, complete.
Complete steam plant, will sell all or any part.
Boilers, like new, 1100 H. P. and 500 H.P. Also transformers, turbines, etc.
1—Complete Tipple with Cleaning Plant.

MISCELLANEOUS

4—All Steel Armco Buildings, various sizes.
20—Jeffrey Molveyors on rubber tires.
1—¾ Yard Shovel and Back Hoe.
1—¾ Yard Crane on Cats.
Battery Supply Tractors, rubber tired.
1—Cantrell Air Compressor on rubber tires.
10—Air Compressors, 1 H.P. to 40 H.P.
2—Joy self propelled rubber tired compressors, 240 cu. ft.
2—Acme Self Propelled rubber tired Compressors, 130 cu. ft.
40—Mine Pumps, all types.
1—Differential 40 Passenger Man-Trip Car.
6—MSA Rock Dusters.
2—Phillips Carriers, 44" and 48" Ga.
2—Barber Greene self propelled Bucket Elevators.
Pipe, Plastic, Steel, Transit, all sizes 1" to 6".
100 Mine Cars, drop bottom, 42" Ga.
30—Mine Cars, drop bottom, 44" Ga.
100-Mine Cars, 18" high, end dump, 44" Ga.
300 Mine Cars, end dump and drop bottom, 20" high, 48" Ga.
1—10 ton Mine Car Scale with Recorder.
15—Brown Fayro HKL and HG Car Spotters.
1—12 ton Differential Slate Larry.
Incline Hoists, 25 to 50 H.P.
1—Jeffrey 6' Aerodyne Fan.
1—Jeffrey 8' Aerodyne Fan.
2—Storage Tanks, 4,000 Gallon.
10,000 Five Gallon G. I. Cans, screw lids.
800 tons Relaying Rail 25# to 80#.
10 tons Copper Trolley and Feeder.
300 Transformers from 1 to 2,000 KVA, 110 to 13,000 primary volts.
400 Electric Motors, 3 to 250 H.P.
Huge stock of mine supplies.
Thousands of Other Items.
600 MSA Mine Lamps, Chargers, etc.
1—Frike Saw Mill complete.

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LARGE DRAGLINES WANTED

1150 Bucyrus-Erie or 7800 Marion

Also Smaller Sizes

Please give brief specifications, price FOB cars and when available.

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313 Hazleton Nat'l Bank Bldg., Hazleton, Pa. • GLadstone 5-3658

FOR SALE

1. McCarthy Coal Auger — Model 1430-36-24: 12' Auger Sections — Diesel GMC Engine — 170' of 30" Auger Sections and head — 132' of 24" dia. Auger Sections and head, extra jacks, transmissions and misc. parts: One new (200 hrs.) TD-18 angle dozer Int. latest model; One Jeep — One Jeep pickup — 6 dump trucks — all equipment excellent condition — Auger 2 yrs. old — uesd 1½ years. Price $50,000 job site — terms to responsible parties.

Write to

Coal Mining

4575 Country Club Dr. Pittsburgh 36, Pa.

FOR SALE

650-B Bucyrus Erie Elec. Drag, 195', 16 yd.
15-W Bucyrus Erie Elec Drag, 215', 13 yd.
631 Page Elec. Dragline, 200', 8 yd.
9-W Bucyrus Erie Elec. Drag, 200', 8 yd.
625 Page Diesel Drag, 150', 10 yd.
723 Page Diesel Drag, 130', 10 yd.
621-S Page Diesel Drag, 125', 7 yd.
200-W Bucyrus Erie Diesel Drag, 125', 6 yd.
7-W Bucyrus Erie Diesel Drag, 180', 5 yd.
5-W Bucyrus Erie Diesel Drag, 120', 6 yd.
2400 Lima Drag, 130', 5 yd.
4500 Manitowoc Drag, 120', 5 yd.
3900 Manitowoc Speedcrane, 100' boom
3500 & 3000 Manitowoc Crawler Crane
5480 Marion 18 yd. Elec. H. L. Shovel
170-B Bucyrus Erie 6½ yd. Elec Shovel
120-B Bucyrus Erie 4 yd. Elec. Shovel
4500 Manitowoc 5 yd. H. L. Shovel
1400 P & H 4 yd. Elec. Shovel
Large selection of smaller Shovels and Draglines available
Model T-750 Reich Truck Mounted Rotary and Down-the-hole Drill
McCarthy & Compton Coal Auger Drills
Euclid Trucks, Truck Cranes, Dozers, Scrapers, Front End Loaders, Drills, Buckets, Attachments and other misc. equipment available.

FRANK SWABB Equipment Co., Inc.

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RAIL
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Nation's Largest Warehouse Stocks
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COAL STRIP WANTED

Complete with equipment, must be low down payment and reasonable terms. All details first letter, price, terms, haul, coal, cover, tipple, equipment, etc.

ROLLING HILLS CONST. CO.
884 Edgewood Ave. Pittsburgh 34, Pa.

FOR SALE

Caterpillar 955 high lift 1½ yd.
GE 30-ton locomotive A-1 - 44" ga.
Battery type 5-ton mine locomotive
C P Coal Drill on rubber tires
Goodman 512 cutter with 10' bars
Hoist 600 HP - large drum 10,000' Rope
Manitowoc 4500 dragline 5-yd. 130' Boom
Dragline P & H 955 - 3-yd. - 75' Boom
Joy 8 BU loaders - Jeffrey 35 B & BB
Joy W-L 80 - 75 HP air compressor on rubber
Joy Cat Truck 250V with hyd. drill
Cleveland Stopper drill with dust col. - New
Jeffrey Coal Crusher & 32E Joy Shuttle Cars
New L600 & 29V Jeffrey parts, also Joy 11B parts
Bucyrus Erie 5-yd. Dragline like new 88-S
Bucyrus-Erie 54B - 3-yd. dragline & 24 TD-Dozer
Marion 2-yd. Shovel & 77 Lorain Shovel Dozers
Lima 1201 - Lorain 80 also 87 Shovels

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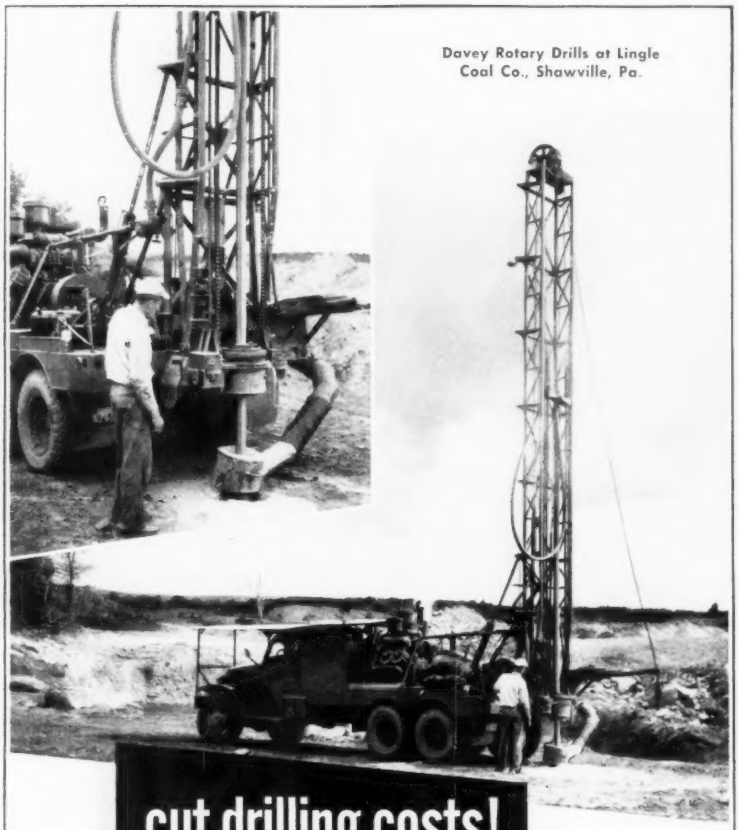

Davey Rotary Drills at Lingle Coal Co., Shawville, Pa.

cut drilling costs!

DAVEY

ROTARY DRILLS

For faster, more economical drilling . . . increased coal production at lower costs, leading strip operators rely on Davey. Suitable for mounting on any make of truck, Davey Rotary Drills move fast between blast holes . . . are ideal for low cost core drilling with air . . . easy to set in drilling position.

Daveys are available in 8 different models—air blast, mud pump, or combination types. Rated capacities to 3,500 ft. Outstanding features include choice of power take-off or separate power unit operation, automatic hydraulic feed, hydraulic pull down, heavy-duty rotary table, rugged tubular box-type mast . . . AA-7015

Write for full details!

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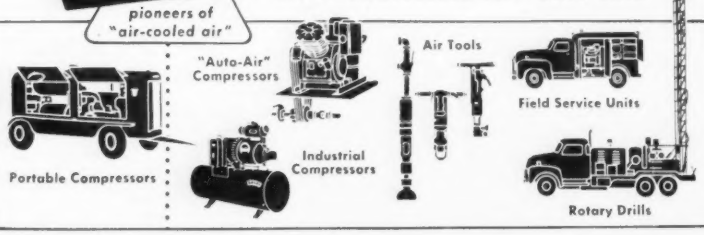

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● The Model BD7U-10′8″ bulldozer for D7 tractors is now available from Caterpillar Dealers, it was announced by Balderson Inc., manufacturer of auxiliary equipment at Wamego, Kansas.

The BD7U blade is designed with a high straight center section that rolls a greater concentrated load ahead while the two side sections, angling at 25 degrees, cast the material inward. Minimum side spillage adds to this higher dozing production. An additional feature is longer track life because the tracks run cleaner. Manufacturer and owners claim production up to more than 50 per cent greater than straight blade dozers.

This U-shaped bulldozer, designed and built to match the power of the current D7 tractor, is said to give greater production on practically all dozing jobs, besides its specialty of holding capacity loads for full length of long passes.

The Balderson BD7U blade requires Cat No. 7S push beams and braces to complete installation, and is available for either cable or hydraulic control.

FOR SALE

2—Ladell Conveyors, each 300' long, 21″ wide with 15 hp motors. Price $4,000.

2—Jeffrey 35-B cutting machines, 8', 4″ bars & chains. One with truck, $2,000; one less truck, $1,600.

1—8t-42″ gauge locomotive. Price on application.

BUSBY COAL CO.

R R I Box 62 Parrish, Ala.

Allis-Chalmers HD-21s guarantee that work will start on time . . . end on time at P&N strip mine.

Allis-Chalmers HD-21s do more work faster at less cost for P&N Coal Co.

Allis-Chalmers HD-21s are on the job 24 hours per day every day at P&N Coal Co.

Near Punxsutawney, P&N Coal Co. uses Allis-Chalmers HD-21s for stripping, backfilling, building access roads . . . every heavy-duty mine job.

Like other leading operators, P&N relies on equipment from Highway to keep costs below estimated limits . . . to beat production schedules . . . and to earn greater profits.

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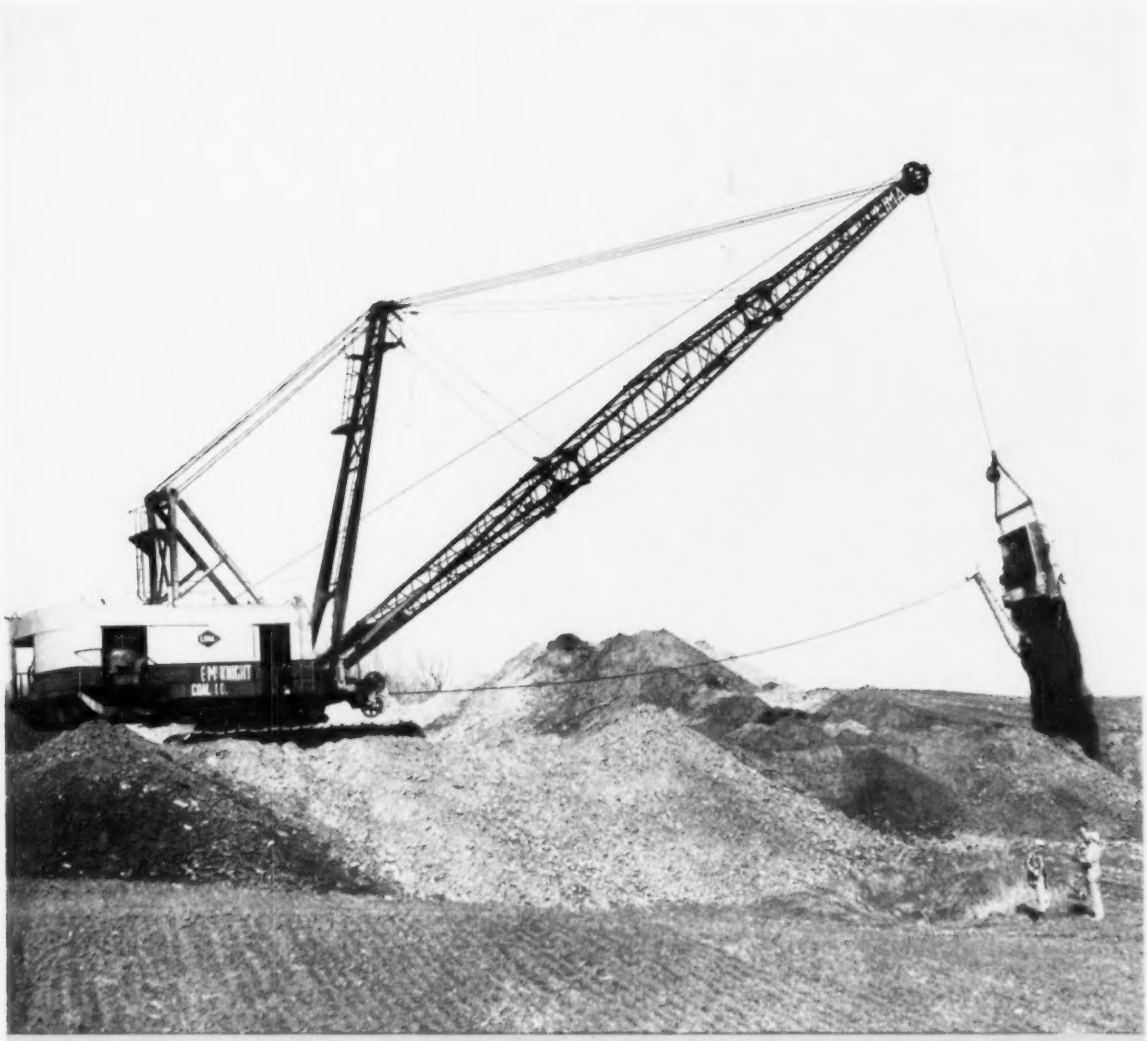

Lima 2400 at Miller & McKnight stripping operation, Harlansburg

Highway service makes good equipment better!

• The difference between mining profit and loss is often due to the type of equipment employed.

• Likewise, the difference between extra good equipment and good equipment is often found in the service facilities of the equipment distributor.

• *Highway backs every item of its equipment with 'round the clock service by factory-trained mechanics.* Also, Highway's own unconditional guarantee of quality applies to each and every piece of equipment it sells . . . strengthens the iron clad warranties of leading manufacturers.

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